

SECTION 08 95 16 00 - WALL VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall vents.
2. Flood and air vents.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration: For each product.
12. Health Product Declaration: For each product.
13. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
14. Environmental Product Declaration: For each product.
15. Environmental Product Declaration: For each product.
16. Environmental Product Declaration: For each product.
17. Third-Party Certifications: For each product.
18. Third-Party Certified Life Cycle Assessment: For each product.

C. Samples: For each type of metal finish required.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For flood vents, from ICC-ES.

B. Sample Warranties: For manufacturer's special warranties.

1.4 WARRANTY

- A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Warranty Period: **[Five][10][20]<Insert number>** years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
 2. Warranty Period: **[Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain vents from single source from single manufacturer.

2.2 WALL VENTS (BRICK VENTS)

- A. Extruded-Aluminum Wall Vents:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Air Flow Company, Inc.]**
 - b. **[Airolite Company, LLC (The)]**
 - c. **[Architectural Louvers Co.; Harray, LLC]**
 - d. **[Arrow United Industries; Mestek, Inc.]**
 - e. **[Construction Specialties, Inc.]**
 - f. **[Greenheck Fan Corporation]**
 - g. **[Hohmann & Barnard, Inc]**
 - h. **[Industrial Louvers Inc.]**
 - i. **[Louvers & Dampers, Inc.; Mestek, Inc.]**
 - j. **[Metal Form Manufacturing LLC; United Enertech Corp.]**

- k. [Nystrom, Inc.]
 - l. [Reliable Products, Inc.]
 - m. [Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.]
 - n. [Safe Air - Dowco]
 - o. [Sunvent Industries; Sylro Sales Corp.]
 - p. [United Enertech Corp.]
 - q. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Air Flow Company, Inc.]
 - b. [Airolite Company, LLC (The)]
 - c. [Architectural Louvers Co.; Harray, LLC]
 - d. [Arrow United Industries; Mestek, Inc.]
 - e. [Construction Specialties, Inc.]
 - f. [Greenheck Fan Corporation]
 - g. [Hohmann & Barnard, Inc]
 - h. [Industrial Louvers Inc.]
 - i. [Louvers & Dampers, Inc.; Mestek, Inc.]
 - j. [Metal Form Manufacturing LLC; United Enertech Corp.]
 - k. [Nystrom, Inc.]
 - l. [Reliable Products, Inc.]
 - m. [Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.]
 - n. [Safe Air - Dowco]
 - o. [Sunvent Industries; Sylro Sales Corp.]
 - p. [United Enertech Corp.]
 - q. <Insert manufacturer's name>
3. Extruded-aluminum louvers and frames, not less than **0.125-inch (3.18-mm)** nominal thickness, assembled by welding; with **18-by-14- (1.4-by-1.8-mm-)** mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.
4. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless steel components.
5. Finish: [Mill]<Insert finish>.

B. Cast-Aluminum Wall Vents:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Airolite Company, LLC (The)]
 - b. [Greenheck Fan Corporation]
 - c. [Hohmann & Barnard, Inc]
 - d. [Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.]
 - e. [Sunvent Industries; Sylro Sales Corp.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Airolite Company, LLC (The)]
 - b. [Greenheck Fan Corporation]
 - c. [Hohmann & Barnard, Inc]
 - d. [Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.]
 - e. [Sunvent Industries; Sylro Sales Corp.]
 - f. <Insert manufacturer's name>
3. One-piece, cast-aluminum louvers and frames; with **18-by-14- (1.4-by-1.8-mm-)** mesh, aluminum insect screening on inside face; incorporating integral waterstop on inside edge of sill; of load-bearing design and construction.
 4. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless steel components.
 5. Finish: Mill.

2.3 FLOOD AND AIR VENTS

- A. Stainless Steel Flood and Air Vents: Type 316 stainless steel welded frame and flood door assembly, designed to automatically release under hydrostatic pressure or rising water level.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Smart Vent Products, Inc.]
 - b. [USA Foundation Flood Air Vents]
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Smart Vent Products, Inc.]
 - b. [USA Foundation Flood Air Vents]
 - c. <Insert manufacturer's name>
 3. Ventilation Area: **[0.354 sq. ft. (0.033 sq. m)][0.708 sq. ft. (0.658 sq. m)][1.417 sq. ft. (1.316 sq. m)]<Insert area>**.
 4. Flood Coverage: **[200 sq. ft. (18.6 sq. m)][400 sq. ft. (37.2 sq. m)][800 sq. ft. (74.3 sq. m)]<Insert area>**.
 5. Finish: **[Mill]<Insert finish>**.

2.4 MATERIALS

- A. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: **ASTM B209 (ASTM B209M)**, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B26/B26M, Alloy 319.
- D. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic

stainless steel, [Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>.

- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- F. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- G. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- H. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- I. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- J. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- K. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- L. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
- B. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 - 1. Color: [Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
- C. Conversion-Coated Finish: AA-C12C42, nonetched, cleaned with inhibited chemicals, and chemical conversion coated with acid chromate-fluoride-phosphate.
- D. Factory-Primed Finish: AA-C12C42R1x with air-dried primer of not less than **2-mil (0.05-mm)** dry film thickness.
- E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

- F. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with **[AAMA 2604][AAMA 2605]** and containing not less than **[50][70]** percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- G. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- H. Superior-Performance Organic Finish, Four-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- I. Superior-Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- J. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.6 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces.
 - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Sheet and Plate Finishes:
 - 1. Cold-Rolled, Bright Finish: ASTM A480/A480M, No. 2B.

2. Directional Satin Finish: ASTM A480/A480M, No. 4.
- D. Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
 1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install according to manufacturer's written instructions.
- B. Locate and place vents level, plumb, and at indicated alignment with adjacent work.
- C. Attach vents securely in place using fasteners supplied or approved by manufacturer.
- D. Protect unpainted surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- E. Build vents into masonry work as construction progresses; comply with requirements in Section 042000 "Unit Masonry."
- F. Provide perimeter reveals of uniform width for sealants and joint fillers, where indicated.
- G. Use concealed anchorages.

3.2 ADJUSTING AND CLEANING

- A. Adjust flood vents for proper operation.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore vents damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 08 95 16 00

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Task	Specification	Specification Description
08 95 16 00	01 11 19 00	No Specification Required
08 95 16 00	05 50 00 00	Metal Fabrications



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SECTION 09 01 20 00 - GYPSUM BOARD RENOVATION

GENERAL

Description Of Work

1. This specification covers the furnishing and installation of materials for gypsum board renovation. Products shall be as directed by the Owner. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

Submittals

2. Quality Assurance/Control Submittals
 - a. Certificates: Manufacturer's written certification that gypsum products meet or exceed specified requirements.

Quality Assurance

3. Regulatory Requirements:
 - a. Gypsum Board Partitions: Listed and labeled for fire-protective ratings as indicated or scheduled.
 - b. Gypsum Board Floor/Ceilings and Roof/Ceiling Assemblies: Listed and labeled for fire protective ratings as indicated or scheduled.
 - c. Fire-Rated Assemblies: Comply with UL 05, FM P8016, or GA 600 for required fire-rated assembly.

Delivery, Storage, And Handling

4. Storage and Protection: Store wallboard off ground to protect it from weather and damage due to moisture damage.
 - a. Wallboard: Dry, free of warpage, and have bundling tape intact immediately prior to use.

Project Conditions

5. Environmental Requirements: Comply with Detailed Scope of Work.
 - a. During gypsum-panel application and finishing, maintain indoor temperatures within range of 13 degrees C (55 degrees F) to 21 degrees C (70 degrees F). Provide adequate ventilation to carry off excess moisture.
6. Existing Conditions: See Division 1 Section "Summary of Work". Do not interfere with use of occupied buildings or portions of buildings. Maintain free and safe passage to and from occupied areas.
7. Protection: Protect grounds, plantings, buildings and any other facilities or property from damage caused by construction operations.

Scheduling And Sequencing

8. Scheduling and Completion: Comply with Detailed Scope of Work.

PRODUCTS

Materials

9. Materials for Patching, Extending, and Matching:

09 - Finishes

- a. Provide same products or types of construction as in existing structure, as needed to patch, extend, or match existing work.
 - 1) Generally, Contract Documents will not define products present in existing construction. Determine products by Inspection and any necessary testing.
 - 2) Patching, extending, and matching of existing work and systems shall result in a complete, finished system.
- b. Presence of product, finish, or type of construction requires that patching, extending, or matching be performed as necessary to make work complete and consistent.

Metals

10. Partition Metals: ASTM C 645, galvanized steel:
 - a. Interior Steel Studs: Minimum 0.46 mm (25 gage), provide sizes and gages to match existing or as indicated.
 - 1) Provide minimum of 0.84 mm (20 gage) studs both sides of hollow metal frames.
 - b. Steel Stud Runners: Match studs. Provide long leg runners for slip joint at structure above to allow for deflection.
 - c. Furring Channels: Hat-shaped furring channels, minimum 0.46 mm (25 gage).
 - d. Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission by resilient attachment of gypsum board, 13 mm (1/2 inch) deep.
 - e. Sheet-Metal Reinforcement (Alternate to Wood Blocking): 1.52 mm (16 gage) minimum.
11. Suspended Coiling Metals:
 - a. Runner Channels: ASTM C 754 cold-rolled steel channels with rust-inhibitive finish.
 - 1) 50 mm (2 Inches) deep, 88 kg per 100 m (590 pounds per 1,000 LF).
 - 2) 38 mm (1-1/2 inch) deep, 70 kg per 100 m (475 pounds per 1,000 LF).
 - 3) 19 mm (3/4 Inch) deep, 45 kg per 100 m (300 pounds per 1,000 LF).
 - b. Furring Channels: Hat-shaped galvanized-steel furring channels, minimum 0.46 mm (25 gage).
 - c. Steel Studs: Galvanized steel as specified above, minimum 0.46 mm (25 gage).
 - d. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
 - 1) Hanger Wire: Minimum 4.1 mm (8 gage).
 - 2) Tie Wire: 6 mm (16 gage).

Gypsum Board And Related Materials

12. Gypsum Board: GA216 and ASTM C 36
 - a. Size: 12.7 mm and 15.9 mm (1/2 inch and 5/8 inch) thick to match existing, as indicated or scheduled. Provide boards 1 200 mm (48 inches) wide by length required to minimize cross joints.
 - b. Regular Tapered-edge gypsum panels.
 - 1) Provide Type X gypsum panels at fire-rated assemblies.
 - c. Water-Resistant: ASTM C 630, paintable, tapered-edge gypsum panels.
 - 1) Provide Type X water-resistant gypsum panels at fire-rated assemblies.
13. Cementitious Backer Units (CBU): ANSI A118.9, nailable/screwable backer board composed of stable Portland cement, aggregates, and reinforcements with ability to remain unaffected by prolonged exposure to moisture, 12.7 mm (1/2 inch) thick.
14. Fasteners:
 - a. Screws: ASTM C 1002, drywall screws, corrosion resistant. Provide types as recommended by manufacturer for each application.
 - 1) Wallboard to Metal Framing: Minimum 25 mm (1 inch), Type S.
 - 2) Wall board to Wood Framing: Minimum 32 mm (1-1/4 inch) Type W bugle head.

- 3) Wall board to Wallboard: Type G.
 - b. Nails: ASTM C 514.
- 15. Accessories: GA 216 and ASTM C 1047, galvanized steel.
 - a. Comer Bead: GA 216 Type CB-114 x 114.
 - b. Metal Trim (Casing Beads): GA 216 Type L, in depth to match gypsum-board thickness.
 - c. Control Joint: V-shaped control joint.
 - d. Adhesive: ASTM C 557 multi-purpose adhesive.
- 16. Finishing Materials: ASTM C 475.
 - a. Joint Tape: Provide type as recommended by panel manufacturer.
 - b. Joint Treatment: Joint compound, adhesive, water, and fasteners.
- 17. Sound-Isolation Materials:
 - a. Sound Insulation: ASTM C 665, Type I (unfaced) mineral fiber blankets, 3.7 to 4.9 kg per sq m (3/4 to 1 PCF), thickness as indicated, scheduled, or required by fire-rated assembly.
 - b. Acoustical Sealant:
 - 1) Concealed: ASTM C 919 nondrying, non-hardening, and non-skinning; non-bleeding; and non-staining.
 - 2) Exposed: ASTM C 919 non-oxidizing and skinning; permanently elastic; and paintable.
 - c. Ductwork Penetrations Packing: Low-density fiberglass.

EXECUTION

Examination

- 18. Units, Spaces, and Areas to be Renovated: Comply with Detailed Scope of Work.
 - a. Existing Conditions: Before beginning installation, examine substrates and framing to receive gypsum board for defects or conditions adversely affecting quality and execution of installation.

Preparation

- 19. Dust Protection: Comply with Detailed Scope of Work.
- 20. Building Occupation: Carry out demolition and renovation work to cause as little inconvenience to occupants as possible. See Detailed Scope of Work.
- 21. Protection: Comply with Detailed Scope of Work.
 - a. Protection: Provide drapes and drop cloths necessary to protect walls, floors, ductwork and piping, electrical work, etc. during drywall finishing operations.
- 22. Selective Demolition: Comply with Detailed Scope of Work.

Laying Out Work

- 23. Discrepancies: Verify dimensions and elevations indicated in layout of existing work.
 - a. Prior to commencing work, carefully compare and check Drawings (if any) for discrepancies in locations or elevations of work to be executed.
 - b. Refer discrepancies among Drawings (if any), Specifications, and existing conditions to the Owner or adjustment before work affected is performed.
 - 1) Failure to make such notification shall place responsibility on Contractor to carry out work in satisfactory, workmanlike manner.
 - c. Contractor: Responsible for location and elevation of construction indicated by Construction Documents.

Performance

09 - Finishes

24. Patching: Patch and extend existing work using skilled mechanics capable of matching existing quality of workmanship.
 - a. Quality of Patched or Extended Work: Not less than specified for new work. If similar new work is not specified, equal to existing work.
25. Damaged Surfaces: Comply with Detailed Scope of Work.
26. Transitions from Existing to New Work: Comply with Detailed Scope of Work.

Erection Of Drywall Stud Partitions

27. Reference Standard: Erect steel framing in accordance with ASTM C 754.
28. Layouts: Align partition studs accurately according to partition layout.
29. Anchoring: Anchor runner channels to concrete slabs with concrete stub nails or power-driven anchors at 600 mm (24 inches) OC. Anchor runner channels to coiling grid, where applicable, with stove bolts. Where studs extend above ceiling system, install headers where required to receive runners.
30. Studs: Position studs vertically in runners. Where studs are located adjacent to openings or partition intersections and comers, anchor studs to runners with manufacturer's metal lock fastener or with 13 mm (1/2 inch) Type S pan-head screws.
 - a. Space studs at 400 mm (16 Inches) and 600 mm (24 inches) OC as indicated or scheduled.
 - 1) Cementitious Backer Units (CBU): Space studs at maximum of 400 mm (16 inches) OC.
 - 2) Limiting Heights: Comply with ASTM C 754 for transverse load of 240 Pa (5 lb-force/SF) without exceeding either allowable stress or deflection of L/240. Comers and Intersections: Locate studs no more than 50 mm (2 inches) from abutting partitions, comers, etc.
 - b. Openings: Locate studs not more than 50 mm (2 inches) from opening frames. Anchor studs to frame anchor clips by bolt or screw attachment. Install headers over openings as recommended by the manufacturer.
 - 1) Solid-Core Wood Doors and Hollow Metal Doors: Provide two full-height studs at jambs fastened together back to back.
 - 2) Fire-Rated Openings: Comply with GA 219.
31. Bracing: Provide diagonal bracing at head of studs that terminate above the ceiling level. Bracing shall consist of metal studs bent to V-shape and extending at 45 degrees from partition head to structure above. Locate bracing 1 200 mm (48 inches) maximum OC.
32. Wood Blocking or Metal Reinforcement:
 - a. Wood Blocking: See Division 6 Section "Rough Carpentry."
 - b. Install metal reinforcement of size required for support of toilet and bath accessories, hardware, cabinets, shelving, counters, and other wall-mounted items.
 - c. Set true to line, level, or plumb well-secured in stud wall and flush with back of drywall or other wall finish.
 - d. Coordinate exact locations with other sections.

Miscellaneous Framing And Furring

33. General: Provide necessary framing and furring for special framing at recesses, offsets, specialty Items, and at wall-mounted casework, shelving, and equipment.
34. Furring Channels: Install furring channels over back-up material. Position channels vertically at 600 mm (24 inches) OC. Use power-activated fasteners or stub nails at 600 mm (24 Inches) OC along alternating flanges. Shim channels level as required.
 - a. Cementitious Backer Units (CBU): Space furring at maximum of 400 mm (16 inches) OC.

35. Resilient Furring Channels: Screw-attach In accordance with manufacturer's recommendations.
 - a. Spacing: 600 mm (24 inches) OC for framing at 16 inches OC and 400 mm (16 inches) OC for framing at 24 Inches OC.

Ceiling Grillage Erection

36. Reference Standard: Erect steel framing In accordance with ASTM C 754.
37. Hangers: Install wire hangers spaced not over 1 200 mm (48 inches) OC in direction of 38 mm (1-1/2 inch) main runner channels and within 150 mm (6 inches) of ends of main runners or interruptions of ceiling continuity. Hang from structure above.
38. Runners: Place main runners not over 1 200 mm (48 inches) OC. Provide, position, and level hangers with hangers saddle-tied along runners. Space furring channels at 600 mm (24 inches) OC at right angles to runner channels and secure with furring channel clips.
39. Reinforcement: At light troffers or other openings, reinforce grillage with 19 mm (3/4 inch) cold-rolled channels wired atop and parallel to main runner channels.
 - a. Provide lateral seismic bracing as required by code.
40. Special Shapes: Provide necessary framing and suspension for off sets, verticals, etc.

Insulation

41. Sound Insulation: Place sound Insulation blankets in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
 - a. Ductwork Penetrations: Provide one-inch wide clearance around ductwork and pack with fiberglass ready for joint sealers.

Installation Of Gypsum Drywall

42. Reference Standards: Apply and finish gypsum board in accordance with GA 216 and ASTM C 840.
43. Partition Gypsum Board Layout: Apply gypsum wallboard panels vertically with abutting ends and edges occurring over stud flanges or furring.
 - a. Joints on Opposite Sides of Partitions: Stagger; joints shall not occur over same stud.
 - b. Two Layer Construction: Stagger Joints between layers.
44. Ceiling Gypsum Board: Apply gypsum board of maximum practical length with long dimensions at right angles to furring channels. End and edge joints shall occur over furring channels with end joints staggered. Properly support gypsum board around cutouts and openings.
45. Fasteners: Apply board to studs or furring with drywall screws spaced 300 mm (12 inches) OC in field of board and 200 mm (8 inches) OC staggered along abutting edges.
46. Water-Resistant: Apply gypsum wallboard manufacturer's recommended sealant to raw cut edges and screw heads.
47. Cementitious Backer Units (CBU): Install in accordance with ANSI A108.11 and manufacturer's recommendations.
48. Accessories:
 - a. Comer Bead: Apply as recommended by manufacturer at exposed outer corners.
 - b. Trim (Casing Beads): Apply as recommended by manufacturer, where gypsum board abuts other materials, and as indicated.
 - c. Control Joints: Comply with GA 216.
 - 1) Walls: Install at not more than 9 m (30 feet) OC.
 - 2) Ceilings: Install at not more than 15 m (50 feet) OC and where framing changes direction.
 - 3) Coordinate locations with the Owner.
49. Access Panels: Securely install access panels furnished under other sections. Set plumb and square to align with finish surface.

09 - Finishes

50. Acoustical Sealant: Seal perimeter and penetrations on both sides of sound-rated partitions and partitions with sound-attenuation blankets with minimum of single 6 mm (1/4 inch) bead of sealant
- a. Locations:
 - 1) Seal around gypsum-board perimeter in angle formed by gypsum-board panels and abutting dissimilar materials.
 - 2) Seal intersections of gypsum board with dissimilar materials.
 - 3) Seal pipe, conduit, ductwork, penetrations, etc.
 - 4) Seal around cutouts for lights, cabinets, pipes, ductwork, electrical boxes, etc.
 - 5) Seal gypsum board panel terminations in door and window frames.
 - 6) Seal control-joint locations before installing control Joints to panels.
 - b. Installation: Comply with ASTM C 919 and requirements of indicated sound-rated assembly. Provide number and positions of beads to comply with sound rating of assembly.
51. Tolerances: Gypsum-board surface plane within plus or minus 3 mm in 3 000 mm (1/8 inch in 10 feet).
52. Finishing: Finish in accordance with GA 214.
- a. Concealed Locations (Not Exposed to View in Rooms): Level 1
 - b. Beneath Tile: Level 2.
 - c. Other Finished Areas: Level 4. Finish joints, trim, and fastener dimples. Sand smooth.
 - d. Cementitious Backer Units (CBU): Treat joints in accordance with ANSI A108.11 and manufacturer's recommendations.

END OF SECTION 09 01 20 00

SECTION 09 01 20 91 - PLASTER RESTORATION

GENERAL

Description Of Work

1. This specification covers the furnishing and installation of materials for lath and plaster renovation. Products shall be as directed by the Owner. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

Quality Assurance

2. Regulatory Requirements:
 - a. Plaster Partitions: Listed and labeled for fire-protective ratings as indicated or scheduled.
 - b. Plaster Floor/Ceilings and Roof/Ceiling Assemblies: Listed and labeled for fire-protective ratings as indicated or scheduled.
 - c. Fire Rated Assemblies: Comply with UL 05, FM P8016, or GA 600 for required fire-rated assembly.

Submittals

3. Product Data: Submit in accordance with Detailed Scope of Work. Include each type of plaster material, metal lath, and lathing accessories to be installed.

Delivery, Storage, And Handling

4. General:
 - a. Plastering Materials: Deliver in original unopened containers and store off ground and under cover.
 - b. Metal Lath and Accessories: Protect from rusting during storage.
 - c. Rusted or Water Damaged Materials: Subject to rejection before or after installation.

Project Conditions

5. Environmental Requirements: Comply with Detailed Scope of Work.
 - a. Cold-Weather Protection: Do not apply plaster if ambient temperature is less than 4 degrees C (40 degrees F) or more than 26 degrees C (80 degrees F). Maintain this temperature range in all areas 7 days prior to application, during application, and for 7 days after plaster is set.
 - b. Hot-Weather Protection: Protect plaster against uneven or excessive evaporation during dry, hot weather and from strong blasts of dry air, either natural or artificial.
 - c. Ventilation: Ventilate building spaces as required to remove water in excess of that required for hydration of plaster. Begin ventilation immediately after plaster is applied and continue until it sets.
6. Existing Conditions: See Division 1 Section "Summary of Work". Do not interfere with use of occupied buildings or portions of buildings. Maintain free and safe passage to and from occupied areas.
7. Protection: Protect grounds, plantings, buildings, and any other facilities or property from damage caused by construction operations.

Scheduling And Sequencing

8. Scheduling and Completion: Comply with Detailed Scope of Work.
 - a. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.

PRODUCTS

Materials

9. Materials for Patching, Extending, and Matching:
 - a. Provide same products or types of construction as existing structure, as needed to patch, extend, or match existing work.
 - 1) Generally, Contract Documents will not define products or standards of workmanship present in existing construction. Determine products by inspection and any necessary testing, and workmanship by use of existing as sample of comparison.
 - 2) Patching, extending, and matching of existing work and systems shall result in complete, finished system.
 - b. Presence of product, finish, or type of construction, requires that patching, extending, or matching shall be performed as necessary to make work complete and consistent.
10. Partition Metals: ASTM C 645, galvanized steel:
 - a. Interior Steel Studs: Minimum 0.46 mm (25 gage), provide sizes and gages to match existing, or as indicated.
 - 1) Provide minimum of 0.84 mm (20 gage) studs both sides of hollow metal frames.
 - b. Steel Stud Runners: Match studs. Provide long leg runners for slip joint at structure above to allow for deflection.
 - c. Furring Channels: Hat-shaped furring channels, minimum 0.46 mm (25 gage).
 - d. Sheet Metal Reinforcement (Alternate to Wood Blocking): 1.52 mm (16 gage) minimum.
11. Suspended Ceiling Metals:
 - a. Main Runners (Primary Members): ASTM C 754 cold-rolled steel channels with rust-inhibitive finish.
 - 1) 50 mm (2 inches) deep, 88 kg per 100 m (590 pounds per 1,000 LF).
 - 2) 38 mm (1-1/2 inch) deep, 70 kg per 100 m (475 pounds per 1,000 LF).
 - 3) 19 mm (3/4 inch) deep, 45 kg per 100 m (300 pounds per 1,000 LF).
 - b. Cross Furring (Furring Channels): Hat-shaped galvanized steel furring channels, minimum 0.46 mm (25 gage).
 - c. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
 - 1) Hanger Wire: Minimum 4.1 mm (8 gage).
 - 2) Tie Wire: 6 mm (16 gage).
12. Lath:
 - a. Metal Lath: ASTM C 847, galvanized expanded metal.
 - 1) Weight: In compliance with ASTM C 841 for conditions and spacing of supports.
 - b. Gypsum Lath: ASTM C 37, plain. Provide Type X at fire-rated assemblies.
 - 1) Thickness: As indicated or specified and in compliance with ASTM C 841 for conditions and spacing of supports.
13. Fasteners:
 - a. Screws: ASTM C 1002, corrosion-resistant. Provide types as recommended by manufacturer for each application.
 - 1) To Metal Framing: Minimum 25 mm (1 inch), Type S.
 - 2) To Wood Framing: Minimum 32 mm (1-1/4 inch), Type W bugle head.
14. Accessories: ASTM C 841, galvanized steel.
 - a. Comer Beads: Small nose with expanded flanges, unless otherwise indicated.
 - b. Casing Beads: Square-edged style. with short or expanded flanges to suit kinds of plaster bases indicated.
 - c. Control Joints: Prefabricated folded pair of non-perforated screeds in M-shaped configuration, with expanded or perforated flanges.
 - 1) Provide removable protective tape on plaster face of control joints.
 - d. Cornerite: Galvanized expanded metal lath in accordance with ASTM C 841.
15. Gypsum Plaster Materials: ASTM C 28.
 - a. Base Coat Plasters: One of following:
 - 1) Gypsum ready-mixed plaster with mill-mixed perlite aggregate.
 - 2) Gypsum wood-fibered plaster, ASTM C 28, Type N.
 - b. Finish Coat Plasters: One of following:

- 1) Gypsum ready-mixed finished plaster, manufacturers standard mill-mixed gauged interior finish.
- 2) Gypsum Gauging Plaster: ASTM C 28, Type G.
- c. Quicklime: ASTM C 5.
- d. Sand: ASTM C 35.
- e. Finishing Hydrated Limes: ASTM C 206, Type S, special hydrated lime for finishing purposes.
- f. Bonding Compound for Gypsum Plaster: ASTM C 631.
- g. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or substances that may be deleterious to plaster or metals in contact with plaster.
16. Sound-Isolation Materials:
 - a. Sound Insulation: ASTM C 665, Type I (unfaced) mineral-fiber blankets, 12 to 16 kg per cu m (0.75 to 1 PCF), thickness as indicated or scheduled, or required by fire-rated assembly.
 - b. Acoustical Sealant:
 - 1) Concealed: ASTM C 919 nondrying, non-hardening, non-skinning, non-bleeding, and non-staining.
 - 2) Exposed: ASTM C 919 non-oxidizing and skinning, permanently elastic, and paintable.
 - c. Ductwork Penetrations Packing: Low-density fiberglass.
17. Gypsum Plaster Mixes: As recommended by manufacturer:
 - a. Scratch Coat:
 - 1) Over Metal Lath: Gypsum wood-fibered plaster, neat or with job-mixed sand.
 - 2) Over Gypsum Lath: Gypsum neat plaster with job-mixed sand.
 - 3) Over Unit Masonry: Gypsum wood-fibered plaster, neat or with job-mixed sand.
 - b. Brown Coat:
 - 1) Over Metal Lath: Gypsum wood-fibered plaster, with job-mixed sand.
 - 2) Over Gypsum Lath: Gypsum neat plaster with job-mixed sand.
 - 3) Over Unit Masonry: Gypsum wood-fibered plaster with job-mixed sand.
 - c. Finish Coat: Proportion materials for finish coats to comply with ASTM C 842 for each type of finish coat and texture indicated.
 - 1) Gypsum Gauging Plaster 1 part plaster and 2 parts lime.
 - a) Over lightweight aggregate base coats, add 15 L (1/2 cubic foot) of perlite fines or 23 kg (50 pounds) of No. 1 white silica sand per 45 kg (100 pounds) of plaster.
 - 2) Gypsum Ready-mixed Finish Plaster Neat.
 - d. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

EXECUTION

Examination

18. Units, Spaces, and Areas to be renovated: Comply with Detailed Scope of Work.
 - a. Verify that surfaces to receive rough carpentry are prepared to required grades and dimensions.

Preparation

19. Dust Protection: Comply with Detailed Scope of Work.
20. Building Occupation: Carry out demolition and renovation work to cause as little inconvenience to occupants as possible. See Detailed Scope of Work.
21. Protection: Comply with Detailed Scope of Work.
 - a. Protection: Provide drapes and drop cloths necessary to protect walls, floors, ductwork and piping, electrical work, etc. during plastering operations.
22. Selective Demolition: Comply with Detailed Scope of Work.

23. Surface Preparation: Clean projections, dust, loose particles, grease, bond breakers, and foreign matter from surfaces to receive plaster.
 - a. Do not apply plaster directly to surfaces (1) of masonry or concrete that have been coated with bituminous compound or other waterproofing agents, or (2) that have been painted or previously plastered.
 - b. Before plaster work is started, wet masonry and concrete surfaces thoroughly with fine fog spray of clean water to produce uniformly moist surface.
 - c. Do not apply plaster to surfaces containing frost.

Laying-Out Work

24. Discrepancies: Verify dimensions and elevations indicated in layout of existing work.
 - a. Prior to commencing work, carefully compare and check Drawings (if any) for discrepancies in locations or elevations of work to be executed.
 - b. Refer discrepancies among Drawings (if any), Specifications, and existing conditions to the Owner for adjustment before work affected is performed.
 - 1) Failure to make such notification shall place responsibility on Contractor to carry out work in satisfactory, workmanlike manner.
25. Contractor: Responsible for location and elevation of construction contemplated by Construction Documents.

Performance

26. Patching: Patch and extend existing work using skilled mechanics who are capable of matching existing quality of workmanship.
 - a. Quality of Patched or Extended Work: Not less than specified for new work. If similar new work is not specified, equal to existing work.
27. Damaged Surfaces: Comply with Detailed Scope of Work.
28. Transitions from Existing to New Work: Comply with Detailed Scope of Work.
29. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition/wall work abuts overhead structure, isolate work from structural movement sufficiently to prevent transfer of loads to work from building structure. Install slip or cushion-type joints to absorb deflections but maintain lateral support.
 - a. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or accessories.

Installation Of Suspended Steel Framing

30. General: Construct ceilings of lath and plaster on suspended steel framing system in accordance with manufacturer's recommendations and Reference Standards.
31. Hanger Installation: Attach hangers to structure above ceiling to comply with NAAMM ML/SFA 920.
32. Ceiling Suspension System Components: Install in sizes and at spacings indicated but not in smaller sizes or greater spacings than those required by ASTM C 841 and NAAMM ML/SFA 920.
 - a. Wire Hangers: Space and install wire hangers in accordance with ASTM C 841 and within 150 mm (6 inches) of channel ends, unless closer spacing indicated or required for fire-resistance rated assembly.
 - b. Main Runners (Primary Members): Space and install channels in accordance with ASTM C 841, unless closer spacing indicated or required for fire-resistance rated assembly.
 - c. Cross Furring (Furring Channels): Space and install furring channels in accordance with ASTM C 841, unless closer spacing indicated or required for fire-resistance rated assembly.
33. Framing Around Openings: Frame channels and lath on suspended soffits and ceilings and at furring to receive electric lights, etc. as indicated or as necessary to complete work. Furnish and install in furring, plaster rings or access panels furnished under other sections.

Installation Of Steel Stud Partitions

34. General: Install steel stud partition support systems in accordance with manufacturer's recommendations and Reference Standards.
35. Steel Stud Systems: Comply with ASTM C 754.
 - a. To Receive Metal Lath: Space studs in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - b. To Receive Gypsum Lath: Space studs in accordance with ASTM C 841.
36. Extend partition support systems to finish ceilings and attach to ceiling suspension members, unless otherwise indicated.

Metal Furring

37. General: Install in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - a. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, bath accessories, furnishings, and similar work to comply with manufacturer's recommendations.
38. Metal Furring to Receive Gypsum Lath: Space furring channels in accordance with ASTM C 841.
39. Metal Furring Systems:
 - a. To Receive Metal Lath: Space furring in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - b. To Receive Gypsum Lath: Space furring in accordance with ASTM C 841.
40. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition/wall work abuts overhead structure, isolate work from structural movement sufficiently to prevent transfer of loads to work from building structure. Install slip or cushion-type joints to absorb deflections but maintain lateral support.
 - a. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or accessories.

Installation Of Suspended Steel Framing

41. General: Construct ceilings of lath and plaster on suspended steel framing system in accordance with manufacturer's recommendations and Reference Standards.
42. Hanger Installation: Attach hangers to structure above ceiling to comply with NAAMM ML/SFA 920.
43. Ceiling Suspension System Components: Install in sizes and at spacings indicated but not in smaller sizes or greater spacings than those required by ASTM C 841 and NAAMM ML/SFA 920.
 - a. Wire Hangers: Space and install wire hangers in accordance with ASTM C 841 and within 150 mm (6 inches) of channel ends, unless closer spacing indicated or required for fire-resistance rated assembly.
 - b. Main Runners (Primary Members): Space and install channels in accordance with ASTM C 841, unless closer spacing indicated or required for fire-resistance rated assembly.
 - c. Cross Furring (Furring Channels): Space and install furring channels in accordance with ASTM C 841, unless closer spacing indicated or required for fire-resistance rated assembly.
44. Framing Around Openings: Frame channels and lath on suspended soffits and ceilings and at furring to receive electric lights, etc. as indicated or as necessary to complete work. Furnish and install in furring, plaster rings or access panels furnished under other sections.

Installation Of Steel Stud Partitions

45. General: Install steel stud partition support systems in accordance with manufacturer's recommendations and Reference Standards.
46. Steel Stud Systems: Comply with ASTM C 754.
 - a. To Receive Metal Lath: Space studs in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - b. To Receive Gypsum Lath: Space studs in accordance with ASTM C 841.
47. Extend partition support systems to finish ceilings and attach to ceiling suspension members, unless otherwise indicated.

Metal Furring

48. General: Install in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - a. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, bath accessories, furnishings, and similar work to comply with manufacturer's recommendations.
49. Metal Furring to Receive Gypsum Lath: Space furring channels in accordance with ASTM C 841.
50. Metal Furring Systems:
 - a. To Receive Metal Lath: Space furring in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - b. To Receive Gypsum Lath: Space furring in accordance with ASTM C 841.

Lathing

51. Metal Lathing: Install in accordance with ASTM C 841 and NAAMM ML/SFA 920.
 - a. At Metal Framing: Attach metal lath to furring channels with long dimension of sheet at right angles to furring channels with gage wire ties spaced not over 150 mm (6 inches) apart.
 - b. At Wood Framing: Nail metal lath to wood framing with long dimension of sheet at right angles to framing member.
 - c. Place ties where sides of sheets laps at supports and at side laps of sheets between supports. Lap metal lath not less than 13 mm (1/2 inch) at sides of sheets and 25 mm (1 inch) at ends of sheets.
 - d. Suspended and Furred Ceilings: Use 1.8 kg/sq m (3.4 pounds/SY) minimum weight diamond mesh lath.
 - e. Ceramic Tile Setting Beds: Use 1.8 kg/sq m (3.4 pounds/SY) minimum weight diamond mesh lath.
52. Gypsum Lath: Install in accordance with ASTM C 841.
 - a. Wood Framing and Furring: Install lath as follows:
 - 1) With screws to comply with lath manufacturer's directions.
 - 2) With nails.
 - 3) Provide floating angle construction.
 - b. Suspended and Furred Ceilings: Install lath to furring members with clips.
 - c. Vertical Metal Framing and Furring: Install lath as follows:
 - 1) With screws.
 - 2) With clips, supplemented by screws where required by lath manufacturer.
 - 3) Where sound-rated partitions are indicated, attach lath with resilient clips.

Installation Of Accessories

53. Accessories: Install as required to repair area of work to match existing. Install in accordance with ASTM C 841. Miter or cope accessories at comers; Install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and alignment during plastering.
54. Interior Corners: Apply cornerite.
55. Corner Beads: Install corner beads tightly secured to lath at exposed exterior corners.
56. Casing Beads: Install at terminations of plaster work, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or metal frames act as casing beads.
57. Control Joints: Install at locations indicated or, if not indicated, at spacings and locations required by Reference Standards. Coordinate specific locations with the Owner.
58. Access Panels: Provide access panels as required for maintenance of concealed plumbing work in coordination with Division 15 Section "Plumbing." Tiled Areas: Coordinate with Division 9 Section "Ceramic Tile."
59. Sound-Rated Plaster Work: Where sound-rated plaster work is indicated by STC ratings or other notation:
 - a. Acoustical Sealant: Seal work at perimeters, control joints, openings, and penetrations with continuous bead of acoustical sealant. Comply with ASTM C 919 and plastering manufacturer's recommendations for location of sealant beads.

- b. Sound Insulation: Install insulation blankets within stud cavities of sound-rated partition assemblies where indicated.

Plastering

- 60. Plastering: Comply with ASTM C 842 in thickness to match existing.
 - a. Preparation: Remove loose, fractured, or separated plaster to face of substrate. repairing lath at substrate to ensure repair area bounded by solid and sound existing plaster construction.
 - 1) Prepare monolithic surfaces for bonded base coats and use bonding compound to comply with Reference Standards for conditioning of monolithic surfaces.
 - b. Grout hollow metal frames, bases, and similar work with base-mat plaster material, and prior to lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 150 mm (6 inches) at each jamb anchor dip.
 - c. Plaster flush with metal frames and other built-in metal items or accessories that act as plaster ground, unless otherwise indicated. Where plaster is not terminated at metal by casing beads, cut base coat free from metal before plaster sets and groove finish coat at junctures with metal.
- 61. Preparation: Check metal grounds, corner beads, screeds, and other accessories carefully for alignment before starting plaster application. Check expansion and control joints and supporting metal structures to ensure that expansion and control joints can move unrestrained.
- 62. Plaster: Apply in accordance with ASTM C 842 in thickness to match existing:
 - a. Use three-coat work over following plaster bases:
 - 1) Metal lath.
 - 2) Gypsum lath attached to ceiling supports by clips.
 - 3) Gypsum lath attached to ceiling supports spaced over 400 mm (16 inches) OC.
 - 4) Gypsum lath, 9.5 mm (3/8 inch) thick, with separate vapor retarder behind.
 - b. Use two-coat work over following bases.
 - 1) Gypsum lath except for installations requiring three-coat work.
 - 2) Unit masonry.
 - 3) Concrete, cast-in-place or precast when surface condition complies with ASTM C 842 for plaster bonded to solid base.
 - c. First Coat: Apply first coat of plaster with such force to secure good key.
 - d. Finish Coats: Apply troweled finish coats unless otherwise indicated.
- 63. Workmanship: Perform work true to line, straight, and plumb.
 - a. Finished Surfaces: Free from waves, dents, bumps, cracks, pits, checks, streaks, catfaces, blisters, or other defects. Cutout and properly replace defective areas.
 - b. Execute work to avoid any irregularity occurring at point or place where one section is joined to another.
 - c. Arises and Angles: True and sharp.
- 64. Tolerances: Plaster surface plane within plus/minus 3 mm in 3 000 mm (1/8 inch in 10 feet).

Integrating Existing Work

- 65. Protection: Comply with Detailed Scope of Work.

Adjustments

- 66. Partition Removal: Comply with Detailed Scope of Work.

Dust Control

- 67. Dust: Comply with Detailed Scope of Work.

Patching And Cleaning

- 68. Cutting and Patching: Do necessary cutting, patching, and repairing and pointing up of plastering after other work is in place to restore defective areas. Repair or replace work to eliminate blisters, buckles, excessive crazing and check-cracking, dry outs, efflorescence, sweat-outs, and similar defects and where bond to substrate has failed.
 - a. Sand smooth-troweled finishes lightly to remove trowel marks and arises.



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69. Cleaning: As rapidly as plastering is completed in each space, clean up rubbish, utensils, and surplus material, sweep floor and leave in neat condition for work of others.
- a. When general plastering is concluded, remove plastering rubbish, equipment, and surplus materials from premises.
 - b. Clean surfaces splattered with plaster.

END OF SECTION 09 01 20 91



Task	Specification	Specification Description
09 01 20 91	09 01 20 00	Gypsum Board Renovation
09 01 30 91	09 30 13 00	Ceramic Tiling
09 01 60 91	01 11 19 00	No Specification Required
09 01 60 91	07 92 00 00	Joint Sealants
09 01 60 91	09 66 13 00	Portland Cement Terrazzo Flooring
09 01 60 91	09 68 13 00	Tile Carpeting
09 01 60 91	09 68 16 00	Sheet Carpeting



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SECTION 09 01 90 52 - MAINTENANCE REPAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparatory cleaning materials.
2. Paint removers.
3. Paint materials.
4. Patching materials.

B. Related Requirements:

1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.
2. Section 040110 "Masonry Cleaning" for cleaning and removing paint from masonry.
3. Section 050170.51 "Decorative Metal Cleaning" for cleaning and removing paint from decorative metal.
4. **[Section 099113 "Exterior Painting," Section 099123 "Interior Painting," Section 099300 "Staining and Transparent Finishing," and Section 099600 "High-Performance Coatings"]**[Section 099114 "Exterior Painting (MPI Standards)," Section 099124 "Interior Painting (MPI Standards)," Section 099301 "Staining and Transparent Finishing (MPI Standards)," and Section 099601 "High-Performance Coatings (MPI Standards)"] for Paint materials and systems for new construction.
5. Section 099423 "Gilding" for oil gilding.

1.2 ALLOWANCES

- A. Allowances for maintenance repainting are specified in Section 012100 "Allowances."

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1. Unit prices apply to authorized work covered by **[quantity allowances]****[estimated quantities]** .
2. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

- A. DSD: Degree of surface deterioration.
- B. Gloss Level G1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.
- C. Gloss Level G2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

- D. Gloss Level G3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.
- E. Gloss Level G4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.
- F. Gloss Level G5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.
- G. Gloss Level G6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.
- H. Gloss Level G7: More than 85 units at 60 degrees, in accordance with ASTM D523.
- I. Low-Pressure Spray: **[100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)]<Insert range of values>** .
- J. Medium-Pressure Spray: **[400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)]<Insert range of values>** .

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site][by web conference]<Insert location>** .

1.6 SEQUENCING

- A. Perform maintenance repainting in the following sequence, which includes Work specified in this and other Sections.
 - 1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect from damage.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of surfaces to be painted.
 - 4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 - 5. Apply paint system.
 - 6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.7 ACTION SUBMITTALS

- A. Product Data: For each specified system and assembly, including components and accessories.
 - 1. Include recommendations for product application and use.
 - 2. Include test data substantiating that products comply with requirements.
- B. Samples: For each type of paint system and each pattern, color, and gloss; **[in sizes indicated below][minimum 6 inches (150 mm) long in least dimension, but not less than whole pattern]** .
 - 1. Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, color, and texture is achieved.
 - 2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.

3. Include a list of materials for each coat of each Sample.
4. Label each Sample for location and application.
5. Sample Size:
 - a. Painted Surfaces: **[4-by-8-inch (100-by-200-mm)]<Insert dimensions>** Samples for each color and material, on hardboard.
 - b. Stained or Natural Wood: **[12-by-12-inch (300-by-300-mm)]<Insert dimensions>** Samples of natural- or stained-wood finish, on representative **<Insert required species of wood>** surfaces.

C. Product List: For each paint product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each MPI-product category specified in paint systems, with the proposed product highlighted.
3. VOC content.

D. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.

1.8 INFORMATIONAL SUBMITTALS

- A. Color Matching Certificate: For computer-matched colors.
- B. Preconstruction Test Reports: For cleaning materials, **[paint removers][and][paint coatings and systems]** .

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.
 1. Quantity: Furnish Owner with an additional **[3][5][7]<Insert number>** percent, but not less than **1 gal. (3.8 L)** or one case, as appropriate, of each material and color applied.

1.10 QUALITY ASSURANCE

- A. Color Matching: Custom computer-match paint colors **[as indicated in a color schedule on Drawings]<Insert requirements>** .

1.11 MOCKUPS

- A. Prepare mockups of maintenance repainting processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
 1. Locate mockups **[on existing surfaces where directed by Architect][in locations that enable viewing under same conditions as the completed Work]<Insert requirement>** .

2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least [100 sq. ft. (9 sq. m)]<Insert dimension> .
3. Coating Mockups: [Two]<Insert number> surfaces of at least [100 sq. ft. (9 sq. m)]<Insert dimension> to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.12 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing of cleaning materials, [paint removers][and][compatibility of paint coatings and systems] for each [indicated] type of painted surface.
 1. Use test areas as indicated and representative of proposed materials and existing construction.
 2. Propose changes to materials and methods to suit Project.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste daily.

1.14 FIELD CONDITIONS

- A. Weather Limitations: Proceed with maintenance repainting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each paint product from single source from single manufacturer.

2.2 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of **140 to 160 deg F (60 to 71 deg C)**.
- C. Detergent Solution: Solution prepared by mixing **2 cups (0.5 L)** of tetrasodium pyrophosphate (TSPP), **1/2 cup (125 mL)** of laundry detergent that contains no ammonia, **5 quarts (5 L)** of 5 percent sodium hypochlorite bleach, and **15 quarts (15 L)** of warm water for every **5 gal. (20 L)** of solution required.
- D. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing **1/3 cup (80 mL)** of household detergent that contains no ammonia, **1 quart (1 L)** of 5 percent sodium hypochlorite bleach, and **3 quarts (3 L)** of warm water.
- E. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.
- F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.3 PAINT REMOVERS

- A. Paint Removers, General: Manufacturer's standard formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Building Restoration Products, Inc.]**
 - b. **[Cathedral Stone Products, Inc.]**
 - c. **[Diedrich Technologies, Inc.; a Hohmann & Barnard company]**
 - d. **[Dumond Chemicals, Inc]**
 - e. **[EaCo Chem, Inc.]**
 - f. **[PROSOCO, Inc]**
 - g. **[Shore Corporation]**
 - h. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Building Restoration Products, Inc.]**
 - b. **[Cathedral Stone Products, Inc.]**
 - c. **[Diedrich Technologies, Inc.; a Hohmann & Barnard company]**
 - d. **[Dumond Chemicals, Inc]**
 - e. **[EaCo Chem, Inc.]**
 - f. **[PROSOCO, Inc]**
 - g. **[Shore Corporation]**
 - h. **<Insert manufacturer's name>**
- B. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation; containing no methylene chloride.

- C. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-forming alkaline paste or gel formulation; containing no methylene chloride.
- D. Solvent-Type Paste Paint Remover: Manufacturer's standard water-rinsable, solvent-type paste or gel formulation.
- E. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation; containing no methanol or methylene chloride.
- F. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinsable, solvent-type paste or gel formulation; containing no methanol or methylene chloride.

2.4 PAINT MATERIALS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule on Drawings]<Insert requirements> .**
- C. MPI Standards: Provide products complying with MPI standards indicated in applicable maintenance repainting schedule articles and listed in the "MPI Approved Products List."
- D. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.
- E. VOC Content: For field applications [**that are inside the weatherproofing system**] , verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Dry-Fog Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 100 g/L.
 - 5. Rust-Preventive Coatings: 100 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Clear Wood Finishes, Varnishes: 275 g/L.
 - 9. Clear Wood Finishes, Lacquers: 275 g/L.
 - 10. Floor Coatings: 50 g/L.
 - 11. Shellacs, Clear: 730 g/L.
 - 12. Shellacs, Pigmented: 550 g/L.
 - 13. Stains: 100 g/L.
- F. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify 90 percent of paints and coatings comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- G. Material Emissions and Pollutant Control: Verify not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system comply with one of the following:
1. Low-Emitting Materials: Verify VOC emissions comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 2. Verify VOC content does not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Nonflat - High-Gloss Coatings: 150 g/L.
 - d. Concrete/Masonry Sealers: 100 g/L.
 - e. Dry-Fog Coatings: 150 g/L.
 - f. Floor Coatings: 100 g/L.
 - g. Industrial Maintenance Coatings: 250 g/L.
 - h. Low-Solids Coatings: 120 g/L.
 - i. Mastic Texture Coatings: 100 g/L.
 - j. Metallic Pigmented Coatings: 500 g/L.
 - k. Pretreatment Wash Primers: 420 g/L.
 - l. Primers, Sealers, and Undercoaters: 100 g/L.
 - m. Reactive Penetrating Sealers: 350 g/L.
 - n. Recycled Coatings: 250 g/L.
 - o. Rust-Preventive Coatings: 250 g/L.
- H. VOC Content: For field applications inside the building, verify wall paints comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Interior Flat Latex Wall Paint: 50 g/L.
 2. Interior Nonflat Latex Wall Paint: 150 g/L.
- I. VOC Emissions: For field applications inside the building, verify wall paints contain no more than half of the chronic REL of VOCs when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify the building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.5 PAINT MATERIALS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
1. **[Benjamin Moore & Co.]**
 2. **[Coronado Paint; Benjamin Moore & Co.]**
 3. **[Insi-X Products; Benjamin Moore & Co.]**
 4. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 5. **[Rodda Paint Co.]**
 6. **[Rust-Oleum Corporation]**
 7. **[Sherwin-Williams Company (The)]**
 8. **[The Pittsburgh Paints Company]**
 9. **[Valspar; a brand of The Sherwin-Williams Company]**
 10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [Benjamin Moore & Co.]
2. [Coronado Paint; Benjamin Moore & Co.]
3. [Insl-X Products; Benjamin Moore & Co.]
4. [Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]
5. [Rodda Paint Co.]
6. [Rust-Oleum Corporation]
7. [Sherwin-Williams Company (The)]
8. [The Pittsburgh Paints Company]
9. [Valspar; a brand of The Sherwin-Williams Company]
10. <Insert manufacturer's name>

2.6 PATCHING MATERIALS

- A. Patching Compound, General: Formulation specifically manufactured for repairs in damaged substrate materials as specified within tooling time required for the detail of work and site conditions; designed for filling voids that have deteriorated from weathering and decay, capable of filling deep holes, and spreading to feather edge.
- B. Metal-Patching Compound: Two-part, polyester-resin, metal-patching compound; knife-grade formulation.
- C. Cementitious Patching Compound: Repair materials specifically formulated and manufactured for filling type of cementitious substrates and for sanding or tooling prior to repainting; as recommended in writing by compound manufacturer for exposure to weather and traffic.
- D. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [Abatron, Inc]
 - b. [Advanced Repair Technology, Inc.]
 - c. [ConServ Epoxy LLC]
 - d. [Gougeon Brothers, Inc.]
 - e. [Polymeric Systems, Inc.; PPG Industries, Inc.]
 - f. [Protective Coating Company]
 - g. [System Three Resins, Inc.]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Abatron, Inc]
 - b. [Advanced Repair Technology, Inc.]
 - c. [ConServ Epoxy LLC]
 - d. [Gougeon Brothers, Inc.]
 - e. [Polymeric Systems, Inc.; PPG Industries, Inc.]
 - f. [Protective Coating Company]

- g. [System Three Resins, Inc.]
- h. <Insert manufacturer's name>

- E. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound in accordance with ASTM C842.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING SURFACES

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
 - 3. Neutralize and collect alkaline and acid wastes before disposal.
 - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 MAINTENANCE REPAINTING, GENERAL

- A. Maintenance Repainting Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at [5 ft. (1.5 m)][10 ft. (3 m)]<Insert distance> away from painted surface and from building exterior at [20 ft. (6 m)][50 ft. (15 m)]<Insert distance> away from painted surface.
- B. Execution of the Work: In repainting surfaces, disturb them as minimally as possible and as follows:
 - 1. Remove failed coatings and corrosion and repaint.
 - 2. Verify that substrate surface conditions are suitable for repainting.
 - 3. Allow other trades to repair items in place before repainting.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the Work, use gentle methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail.
- D. Heat Processes: Do not use torches, heat guns, or heat plates.

3.3 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content

of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:

1. Concrete: 12 percent.
 2. Gypsum Board: 12 percent.
 3. Gypsum Plaster: 12 percent.
 4. Masonry (Clay and CMU): 12 percent.
 5. Portland Cement Plaster (Stucco): 12 percent.
 6. Wood: 15 percent.
- C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Application of coating indicates acceptance of surfaces and conditions.

3.4 APPLICATION OF PREPARATORY CLEANING MATERIALS

- A. General: Use the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.
- C. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.
- D. Mildew Removal: Clean off existing mildew by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. Rinse with water applied by clean rags or sponges.
- E. Chemical Rust Removal:
1. Remove loose rust scale with specified abrasives for ferrous-metal cleaning.
 2. Apply rust remover with brushes or as recommended in writing by manufacturer.
 3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing. Do not allow extended dwell time.
 4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.

5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

F. Mechanical Rust Removal:

1. Remove rust with specified abrasives for ferrous-metal cleaning. Clean to bright metal.
2. Wipe off residue with mineral spirits and either steel wool or soft rags.
3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.5 APPLICATION OF PAINT REMOVERS

A. General: Remove paint where indicated on Drawings. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.

1. Application: Apply paint removers in accordance with paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than recommended in writing by manufacturer.
 - a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
 - b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.
2. Brushes: Use brushes that are resistant to chemicals being used.
 - a. Metal Substrates: If using wire brushes on metal, use brushes of same metal composition as metal being treated.
 - b. Wood Substrates: Do not use wire brushes.
3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gauges.
 - b. Unless otherwise indicated, hold spray nozzle at least **6 inches (150 mm)** from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
 - c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
 - d. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 - e. For heated water-spray application, use equipment capable of maintaining temperature between **140 and 160 deg F (60 and 71 deg C)** at flow rates indicated.

B. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material.

C. Paint Removal with Alkaline Paste Paint Remover:

1. Remove loose and peeling paint using [**water,**] scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or

- as determined by preconstruction testing.
4. Rinse with [**cold**][**hot**] water applied by [**low**][**medium**] -pressure spray to remove chemicals and paint residue.
 5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
 6. Repeat process if necessary to remove all paint.

D. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:

1. Remove loose and peeling paint using [**water**,] scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes or as recommended in writing by manufacturer.
3. Apply cover in accordance with manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with [**cold**][**hot**] water applied by [**low**][**medium**] -pressure spray to remove chemicals and paint residue.
7. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
8. For spots of remaining paint, apply alkaline paste paint remover in accordance with "Paint Removal with Alkaline Paste Paint Remover" Paragraph.

E. Paint Removal with Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using [**water**,] scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply thick coating of paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paintbrush. Apply in one or two coats in accordance with manufacturer's written instructions.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with [**cold**][**hot**] water applied by [**low**][**medium**] -pressure spray to remove chemicals and paint residue.
5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
6. Repeat process if necessary to remove all paint.

F. Paint Removal with Covered, Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using [**water**,] scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paint brush or as recommended in writing by manufacturer.
3. Apply cover in accordance with manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with [**cold**][**hot**] water applied by [**low**][**medium**] -pressure spray to remove chemicals and paint residue.
7. Use mechanical methods recommended in writing by manufacturer to remove remaining chemicals and paint residue.

3.6 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Metal Substrates:
 - 1. Preparation: Treat repair locations by wire-brushing and solvent cleaning. Use **[chemical][or][mechanical]** rust removal method to clean off rust.
 - 2. Defects in Metal Surfaces: Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than **[1/16 inch (6 mm)][1/8 inch (3 mm)]<Insert dimension>** deep or **[1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension>** across and all holes and cracks by filling with metal-patching compound and sanding smooth. Remove burrs and protruding fasteners.
 - 3. Priming: Prime iron and steel surfaces immediately after repair to prevent flash rusting. Stripe paint corners, crevices, bolts, welds, and sharp edges. Apply two coats to surfaces that are inaccessible after completion of the Work.
- C. Cementitious Material Substrates:
 - 1. General: Repair defects including dents and chips more than **[1/4 inch (6 mm)][1/2 inch (13 mm)]<Insert dimension>** in size and all holes and cracks by filling with cementitious patching compound and sanding smooth. Remove protruding fasteners.
 - 2. New and Bare Portland Cement Plaster (Stucco): Neutralize surface of plaster with mild acid solution as recommended in writing by paint manufacturer. In lieu of acid neutralization, follow manufacturer's written instruction for primer or transition coat over alkaline plaster surfaces.
 - 3. Existing Concrete, Cement Plaster, and Other Cementitious Substrates: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. If surfaces are too alkaline to paint, correct this condition before painting.
- D. Wood Substrates:
 - 1. Repair wood defects including dents and gouges more than **[1/8 inch (3 mm)][1/4 inch (6 mm)]<Insert dimension>** in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.
 - 2. Where existing paint is allowed to remain, sand irregular buildup of paint, runs, and sags to achieve a uniformly smooth surface.
- E. Gypsum-Plaster and Gypsum-Board Substrates:
 - 1. Repair defects including dents and chips more than **[1/8 inch (3 mm)][1/4 inch (6 mm)]<Insert dimension>** in size and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth. Remove protruding fasteners.
 - 2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.

3.7 APPLICATION OF PAINT MATERIALS, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
- B. Prepare surfaces to be painted in accordance with the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings.

- D. Metal Substrates: Stripe paint corners, crevices, bolts, welds, and sharp edges before applying full coat. Apply two coats to surfaces that are inaccessible after completion of the Work. Tint stripe coat different than the main coating and apply with brush.
- E. Blending Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

3.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.
- B. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.
 - 1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:
 - a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - b. Testing agency will perform tests for compliance of paint materials with product requirements.
 - c. If test results show materials being used do not comply with product requirements, Contractor will remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
 - 2. Dry Film Thickness:
 - a. Contractor will touch up and restore painted surfaces damaged by testing.
 - b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor will pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.9 CLEANING

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.10 PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.11 SURFACE-PREPARATION SCHEDULE

- A. General: Before painting, prepare surfaces [**where indicated on Drawings**] for painting in accordance with applicable requirements specified in this schedule.
 - 1. Examine surfaces to evaluate each surface condition in accordance with paragraphs below.
 - 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
 - 3. Repair substrate defects in accordance with "Substrate Repair" Article.
- B. Surface Preparation for Sound Surfaces: **[MPI DSD 0]<Insert designation>** .
 - 1. Surface Condition: Existing paint film in good condition and tightly adhered.
 - 2. Paint Removal: Not required.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Roughen or degloss cleaned surfaces to ensure paint adhesion in accordance with paint manufacturer's written instructions.
- C. Surface Preparation for Slightly Deteriorated Surfaces: **[MPI DSD 1]<Insert designation>** .
 - 1. Surface Condition: Paint film cracked or broken but adhered. Surface may include visual (aesthetic) defects that do not affect film's protective properties.
 - 2. Paint Removal: Scrape by hand-tool cleaning methods to remove loose paint until only tightly adhered paint remains.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use other cleaning methods for small areas of bare substrate if required. Roughen, degloss, and sand the cleaned surfaces to ensure paint adhesion and a smooth finish in accordance with paint manufacturer's written instructions.
- D. Surface Preparation for Moderately Deteriorated Surfaces: **[MPI DSD 2]<Insert designation>** .
 - 1. Surface Condition: Paint film loose, flaking, or peeling. Surface may show fading such as gloss reduction, slight surface contamination, minor pin holes, scratches, or minor cosmetic defects such as runs or sags.
 - 2. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool or chemical paint-removal methods.
 - 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Use other cleaning methods for small areas of bare substrate if required. Sand surfaces to smooth remaining paint film edges. Prepare bare cleaned surface to be painted in accordance with paint manufacturer's written instructions for substrate construction materials.
- E. Surface Preparation for Severely Deteriorated Surfaces: **[MPI DSD 3]<Insert designation>** .
 - 1. Surface Condition: Paint film [**severely deteriorated**][**obscuring fine architectural detail work because of paint-layer buildup**][**and**][**surface indicated to have paint completely removed**] .
 - 2. Paint Removal: Completely remove paint film by hand-tool or chemical paint-removal methods. Remove rust.
 - 3. Preparation for Painting: Prepare bare cleaned surface in accordance with paint manufacturer's written instructions for substrate construction materials.
- F. Surface Preparation for Damaged Substrate Surfaces: **[MPI DSD 4]<Insert designation>** .

1. Surface Condition: Missing material, small holes and openings, and damaged or corroded substrate.
2. Substrate Preparation: Repair, replace, and treat substrate in accordance with "Substrate Repair" Article [**and requirements in other Specification Sections**] .
3. Preparation for Painting: Sand substrate surfaces to smooth remaining paint film edges and prepare in accordance with paint manufacturer's written instructions for substrate construction materials. Remove rust.
4. Painting: Paint as required for [**MPI DSD 2**] <Insert designation> degree of surface degradation.

3.12 EXTERIOR MAINTENANCE REPAINTING SCHEDULE

A. Ferrous Metal Substrates:

1. Alkyd System: [**MPI REX 5.1D**] <Insert system description> system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**] <Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**] <Insert designation> degree of surface degradation, spot prime with primer, metal, surface tolerant [, **MPI #23**] .
 - 3) For [**MPI DSD 3**] <Insert designation> degree of surface degradation, fully prime coat with primer, metal, surface tolerant [, **MPI #23**] .
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, exterior (Gloss Level G5) [, **MPI #94**] .
 - 2) Alkyd, exterior (Gloss Level G6) [, **MPI #9**] .
 - 3) <Insert manufacturer's name; product name or designation> .
2. High-Performance, Pigmented-Polyurethane-over-Epoxy System: [**MPI REX 5.1H**] <Insert system description> system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**] <Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**] <Insert designation> degree of surface degradation, spot prime with primer, epoxy, anti-corrosive, for metal [, **MPI #101**] .
 - 3) For [**MPI DSD 3**] <Insert designation> degree of surface degradation, fully prime coat with primer, epoxy, anti-corrosive, for metal [, **MPI #101**] .
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat in Primed Areas: Epoxy, high build [, **MPI #108**] .
 - c. Topcoat: Polyurethane, two-component, pigmented, Gloss Level G6 [, **MPI #72**] .
 - 1) <Insert manufacturer's name; product name or designation> .
 - d. Second Topcoat: Match topcoat.

B. Dimension Lumber Substrates:

1. Applications: Columns, beams, soffits, siding, and fencing.
2. Latex System: **[MPI REX 6.2A]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 3) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, latex, for exterior wood [, **MPI #6**] .
 - 4) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 5) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, latex, for exterior wood [, **MPI #6**] .
 - 6) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, exterior, Gloss Levels G1-G2 [, **MPI #10**] .
 - 2) Latex, exterior, Gloss Levels G3-G4 [, **MPI #15**] .
 - 3) Latex, exterior, Gloss Level G5 [, **MPI #11**] .
 - 4) Latex, exterior, Gloss Level G6 [, **MPI #119**] .
 - 5) **<Insert manufacturer's name; product name or designation>** .
3. Alkyd System: **[MPI REX 6.2C]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, exterior, Gloss Level G1 [, **MPI #8**] .
 - 2) Alkyd, exterior, Gloss Level G5 [, **MPI #94**] .
 - 3) Alkyd, exterior, Gloss Level G6 [, **MPI #9**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .

C. Dressed Lumber Substrates:

1. Applications: Doors, windows, door and window frames, casings, and smooth fascia.
2. Latex System: **[MPI REX 6.3A]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime

- with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 3) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, exterior, Gloss Levels G1-G2 [, **MPI #10**] .
 - 2) Latex, exterior, Gloss Levels G3-G4 [, **MPI #15**] .
 - 3) Latex, exterior, Gloss Level G5 [, **MPI #11**] .
 - 4) Latex, exterior, Gloss Level G6 [, **MPI #119**] .
 - 5) <Insert manufacturer's name; product name or designation> .
3. Alkyd System: [**MPI REX 6.3B**]<Insert system description> system [over a transition coat] .
- a. Prime Coat:
 - 1) For [**MPI DSD 1**]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 3) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, exterior, Gloss Level G1 [, **MPI #8**] .
 - 2) Alkyd, exterior, Gloss Level G5 [, **MPI #94**] .
 - 3) Alkyd, exterior, Gloss Level G6 [, **MPI #9**] .
 - 4) <Insert manufacturer's name; product name or designation> .
4. Varnish System (Clear): [**MPI REX 6.3F**]<Insert system description> .
- a. Prime Coat:
 - 1) For [**MPI DSD 1**]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with topcoat.
 - 3) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with topcoat.
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Varnish, with UV inhibitor, exterior, Gloss Level G5 [, **MPI #30**] .
 - 2) Varnish, with UV inhibitor, exterior, Gloss Level G6 [, **MPI #29**] .
 - 3) Varnish, marine spar, exterior, Gloss Level G6 [, **MPI #28**] .
 - 4) <Insert manufacturer's name; product name or designation> .

D. Wood Decks and Stairs Substrates:

1. Latex Porch and Floor System over Alkyd Primer: **[MPI REX 6.5A]<Insert system description>** system **[over a transition coat]** .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5]** .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5]** .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Floor paint, latex, low gloss [, **MPI #60]** .
 - 2) Floor paint, latex, gloss [, **MPI #68]** .
 - 3) **<Insert manufacturer's name; product name or designation>** .
 - d. Topcoat Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
2. Alkyd Floor Enamel System: **[MPI REX 6.5B]<Insert system description>** system **[over a transition coat]** .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with topcoat.
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with topcoat.
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Floor enamel, alkyd, low gloss [, **MPI #59]** .
 - 2) Floor enamel, alkyd, gloss [, **MPI #27]** .
 - 3) **<Insert manufacturer's name; product name or designation>** .
 - d. Topcoat Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

E. Wood Shingles and Shakes:

1. Latex System: **[MPI REX 6.6A]<Insert system description>** system **[over a transition coat]** .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5]** .

- 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, exterior, Gloss Levels G1-G2 [, **MPI #10**] .
 - 2) Latex, exterior, Gloss Levels G3-G4 [, **MPI #15**] .
 - 3) Latex, exterior, Gloss Level G5 [, **MPI #11**] .
 - 4) Latex, exterior, Gloss Level G6 [, **MPI #119**] .
 - 5) **<Insert manufacturer's name; product name or designation>** .
2. Alkyd System: **[MPI REX 6.6B]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, for exterior wood [, **MPI #5**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, exterior, Gloss Level G1 [, **MPI #8**] .
 - 2) Alkyd, exterior, Gloss Level G5 [, **MPI #94**] .
 - 3) Alkyd, exterior, Gloss Level G6 [, **MPI #9**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .

3.13 INTERIOR MAINTENANCE REPAINTING SCHEDULE

A. Ferrous Metal Substrates:

1. Latex System: **[MPI RIN 5.1N]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, metal, surface tolerant [, **MPI #23**] .
 - 3) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, alkyd, anti-corrosive, for metal [, **MPI #79**] .
 - 4) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, rust inhibitive, water based [, **MPI #107**] .
 - 5) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, metal, surface tolerant [, **MPI #23**] .
 - 6) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, alkyd, anti-corrosive, for metal [, **MPI #79**] .
 - 7) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime

- coat with primer, rust inhibitive, water based [, **MPI #107**] .
- 8) <Insert manufacturer's name; product name or designation> .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
- 1) Latex, interior, Gloss Level G1 [, **MPI #53**] .
 - 2) Latex, interior, Gloss Level G2 [, **MPI #44**] .
 - 3) Latex, interior, Gloss Level G3 [, **MPI #52**] .
 - 4) Latex, interior, Gloss Level G4 [, **MPI #43**] .
 - 5) Latex, interior, Gloss Level G5 [, **MPI #54**] .
 - 6) Latex, interior, Gloss Level G6 [, **MPI #114**] .
 - 7) <Insert manufacturer's name; product name or designation> .
2. Alkyd System: [**MPI RIN 5.1E**]<Insert system description> system [over a transition coat] .
- a. Prime Coat:
- 1) For [**MPI DSD 1**]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with primer, metal, surface tolerant [, **MPI #23**] .
 - 3) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with primer, alkyd, anti-corrosive, for metal [, **MPI #79**] .
 - 4) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, metal, surface tolerant [, **MPI #23**] .
 - 5) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, alkyd, anti-corrosive, for metal [, **MPI #79**] .
 - 6) <Insert manufacturer's name; product name or designation> .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
- 1) Alkyd, interior, Gloss Level G1 [, **MPI #49**] .
 - 2) Alkyd, interior, Gloss Level G3 [, **MPI #51**] .
 - 3) Alkyd, interior, Gloss Level G5 [, **MPI #47**] .
 - 4) Alkyd, interior, Gloss Level G6 [, **MPI #48**] .
 - 5) <Insert manufacturer's name; product name or designation> .
3. High-Performance, Pigmented-Polyurethane-over-Epoxy System: [**MPI RIN 5.1H**]<Insert system description> system [over a transition coat] .
- a. Prime Coat:
- 1) For [**MPI DSD 1**]<Insert designation> degree of surface degradation, touch up with epoxy, gloss [, **MPI #77**] .
 - 2) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with primer, zinc rich, organic [, **MPI #18**] .
 - 3) For [**MPI DSD 2**]<Insert designation> degree of surface degradation, spot prime with primer, zinc rich, epoxy [, **MPI #20**] .
 - 4) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, zinc rich, organic [, **MPI #18**] .
 - 5) For [**MPI DSD 3**]<Insert designation> degree of surface degradation, fully prime coat with primer, zinc rich, epoxy [, **MPI #20**] .
 - 6) <Insert manufacturer's name; product name or designation> .

- b. Intermediate Coat in Primed Areas: Epoxy, gloss [, **MPI #77**] .
- c. Topcoat: Polyurethane, two-component, pigmented, Gloss Level G6 [, **MPI #72**] .

1) **<Insert manufacturer's name; product name or designation>** .

- d. Second Topcoat: Matching topcoat.

B. Dimension Lumber Substrates:

- 1. Applications: Columns, beams, exposed joists, and underside of decking.
- 2. Latex System over Latex Primer: [**MPI RIN 6.2D**]**<Insert system description>** system [**over a transition coat**] .

a. Prime Coat:

- 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
- 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with primer, latex, for interior wood [, **MPI #39**] .
- 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with primer, latex, for interior wood [, **MPI #39**] .
- 4) **<Insert manufacturer's name; product name or designation>** .

- b. Intermediate Coat: Matching topcoat.

c. Topcoat:

- 1) Latex, interior, Gloss Level G1 [, **MPI #53**] .
- 2) Latex, interior, Gloss Level G2 [, **MPI #44**] .
- 3) Latex, interior, Gloss Level G3 [, **MPI #52**] .
- 4) Latex, interior, Gloss Level G4 [, **MPI #43**] .
- 5) Latex, interior, Gloss Level G5 [, **MPI #54**] .
- 6) Latex, interior, Gloss Level G6 [, **MPI #114**] .
- 7) **<Insert manufacturer's name; product name or designation>** .

- 3. Latex System over Alkyd Primer: [**MPI RIN 6.2A**]**<Insert system description>** system [**over a transition coat**] .

a. Prime Coat:

- 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
- 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
- 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
- 4) **<Insert manufacturer's name; product name or designation>** .

- b. Intermediate Coat: Matching topcoat.

c. Topcoat:

- 1) Latex, interior, Gloss Level G1 [, **MPI #53**] .
- 2) Latex, interior, Gloss Level G2 [, **MPI #44**] .
- 3) Latex, interior, Gloss Level G3 [, **MPI #52**] .
- 4) Latex, interior, Gloss Level G4 [, **MPI #43**] .
- 5) Latex, interior, Gloss Level G5 [, **MPI #54**] .

- 6) Latex, interior, Gloss Level G6 [, **MPI #114**] .
 - 7) **<Insert manufacturer's name; product name or designation>** .
4. Alkyd System: [**MPI RIN 6.2C**]**<Insert system description>** system [**over a transition coat**] .
- a. Prime Coat:
 - 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
 - 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, interior, Gloss Level G1 [, **MPI #49**] .
 - 2) Alkyd, interior, Gloss Level G3 [, **MPI #51**] .
 - 3) Alkyd, interior, Gloss Level G5 [, **MPI #47**] .
 - 4) Alkyd, interior, Gloss Level G6 [, **MPI #48**] .
 - 5) **<Insert manufacturer's name; product name or designation>** .

C. Wood Dressed Lumber Substrates:

1. Applications: Doors, windows, door and window frames, and moldings.
2. Latex System over Latex Primer: [**MPI RIN 6.3U**]**<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with primer, latex, for interior wood [, **MPI #39**] .
 - 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with primer, latex, for interior wood [, **MPI #39**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, Gloss Level G5 [, **MPI #54**] .
 - 2) Latex, interior, Gloss Level G6 [, **MPI #114**] .
 - 3) **<Insert manufacturer's name; product name or designation>** .
3. Low-Odor Latex System over Latex Primer: [**MPI RIN 6.3V**]**<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with primer, latex, for interior wood [, **MPI #39**] .

- 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, latex, for interior wood [, **MPI #39**] .
- 4) **<Insert manufacturer's name; product name or designation>** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
 - 1) Latex, interior, institutional low odor/VOC, Gloss Level G1 [, **MPI #143**] .
 - 2) Latex, interior, institutional low odor/VOC, Gloss Level G2 [, **MPI #144**] .
 - 3) Latex, interior, institutional low odor/VOC, Gloss Level G3 [, **MPI #145**] .
 - 4) Latex, interior, institutional low odor/VOC, Gloss Level G4 [, **MPI #146**] .
 - 5) Latex, interior, institutional low odor/VOC, Gloss Level G5 [, **MPI #147**] .
 - 6) Latex, interior, institutional low odor/VOC, Gloss Level G6 [, **MPI #148**] .
 - 7) **<Insert manufacturer's name; product name or designation>** .
4. Latex System over Alkyd Primer: **[MPI RIN 6.3A]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, Gloss Level G5 [, **MPI #54**] .
 - 2) Latex, interior, Gloss Level G6 [, **MPI #114**] .
 - 3) **<Insert manufacturer's name; product name or designation>** .
5. Alkyd System: **[MPI RIN 6.3B]<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, interior, Gloss Level G5 [, **MPI #47**] .
 - 2) Alkyd, interior, Gloss Level G6 [, **MPI #48**] .
 - 3) **<Insert manufacturer's name; product name or designation>** .
6. Alkyd Varnish System (Clear): **[MPI RIN 6.3J]<Insert system description>** .

- a. Prime Coat:
 - 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with shellac [, MPI #88] .
 - 3) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with alkyd, sanding sealer, clear [, MPI #102] .
 - 4) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with shellac [, MPI #88] .
 - 5) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with alkyd, sanding sealer, clear [, MPI #102] .
 - 6) <Insert manufacturer's name; product name or designation> .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
 - 1) Varnish, interior, Gloss Level G1 [, MPI #73] .
 - 2) Varnish, interior, Gloss Level G5 [, MPI #74] .
 - 3) Varnish, interior, Gloss Level G6 [, MPI #75] .
 - 4) <Insert manufacturer's name; product name or designation> .

D. Wood Paneling, Casework, and Millwork:

- 1. Latex System over Latex Primer: [MPI RIN 6.4T]<Insert system description> system [over a transition coat] .
 - a. Prime Coat:
 - 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with primer, latex, for interior wood [, MPI #39] .
 - 3) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with primer, latex, for interior wood [, MPI #39] .
 - 4) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, Gloss Level G5 [, MPI #54] .
 - 2) Latex, interior, Gloss Level G6 [, MPI #114] .
 - 3) <Insert manufacturer's name; product name or designation> .
- 2. Low-Odor Latex System over Latex Primer: [MPI RIN 6.4D]<Insert system description> system [over a transition coat] .
 - a. Prime Coat:
 - 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with primer, latex, for interior wood [, MPI #39] .
 - 3) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with primer, latex, for interior wood [, MPI #39] .
 - 4) <Insert manufacturer's name; product name or designation> .

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, institutional low odor/VOC, Gloss Level G1 [, **MPI #143**] .
 - 2) Latex, interior, institutional low odor/VOC, Gloss Level G2 [, **MPI #144**] .
 - 3) Latex, interior, institutional low odor/VOC, Gloss Level G3 [, **MPI #145**] .
 - 4) Latex, interior, institutional low odor/VOC, Gloss Level G4 [, **MPI #146**] .
 - 5) Latex, interior, institutional low odor/VOC, Gloss Level G5 [, **MPI #147**] .
 - 6) Latex, interior, institutional low odor/VOC, Gloss Level G6 [, **MPI #148**] .
 - 7) **<Insert manufacturer's name; product name or designation>** .
3. Latex System over Alkyd Primer: [**MPI RIN 6.4A**]**<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
 - 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, Gloss Level G1 [, **MPI #53**] .
 - 2) Latex, interior, Gloss Level G2 [, **MPI #44**] .
 - 3) Latex, interior, Gloss Level G3 [, **MPI #52**] .
 - 4) Latex, interior, Gloss Level G4 [, **MPI #43**] .
 - 5) Latex, interior, Gloss Level G5 [, **MPI #54**] .
 - 6) Latex, interior, Gloss Level G6 [, **MPI #114**] .
 - 7) **<Insert manufacturer's name; product name or designation>** .
4. Alkyd System: [**MPI RIN 6.4C**]**<Insert system description>** system [**over a transition coat**] .
 - a. Prime Coat:
 - 1) For [**MPI DSD 1**]**<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For [**MPI DSD 2**]**<Insert designation>** degree of surface degradation, spot prime with undercoat, enamel, interior [, **MPI #46**] .
 - 3) For [**MPI DSD 3**]**<Insert designation>** degree of surface degradation, fully prime coat with undercoat, enamel, interior [, **MPI #46**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Alkyd, interior, Gloss Level G1 [, **MPI #49**] .
 - 2) Alkyd, interior, Gloss Level G3 [, **MPI #51**] .
 - 3) Alkyd, interior, Gloss Level G5 [, **MPI #47**] .
 - 4) Alkyd, interior, Gloss Level G6 [, **MPI #48**] .
 - 5) **<Insert manufacturer's name; product name or designation>** .

5. Alkyd Varnish System over Stain: **[MPI RIN 6.4F]<Insert system description>** .
- a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with stain, semi-transparent, for interior wood [, **MPI #90**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with stain, semi-transparent, for interior wood [, **MPI #90**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Varnish, interior, Gloss Level G1 [, **MPI #73**] .
 - 2) Varnish, interior, Gloss Level G5 [, **MPI #74**] .
 - 3) Varnish, interior, Gloss Level G6 [, **MPI #75**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - d. Stain Color: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule on Drawings]<Insert requirements>** .

E. Wood Floors and Stairs Substrates:

1. Latex Porch and Floor System over Alkyd Primer: **[MPI RIN 6.5J]<Insert system description>** system [**over a transition coat**] .
- a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer sealer, alkyd, interior [, **MPI #45**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer sealer, alkyd, interior [, **MPI #45**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Floor paint, latex, low gloss [, **MPI #60**] .
 - 2) Floor paint, latex, gloss [, **MPI #68**] .
 - 3) **<Insert manufacturer's name; product name or designation>** .
 - d. Topcoat Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
2. Alkyd Floor Enamel System: **[MPI RIN 6.5A]<Insert system description>** system [**over a transition coat**] .
- a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.

- 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with topcoat.
- 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with topcoat.
- 4) **<Insert manufacturer's name; product name or designation>** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
 - 1) Floor paint, alkyd, low gloss [, **MPI #59**] .
 - 2) Floor enamel, alkyd, gloss [, **MPI #27**] .
 - 3) **<Insert manufacturer's name; product name or designation>** .
- d. Topcoat Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
3. Polyurethane Varnish System (Clear): **[MPI RIN 6.5C]<Insert system description>** .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with topcoat.
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with topcoat.
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil modified, gloss [, **MPI #56**] .
 - 1) **<Insert manufacturer's name; product name or designation>** .
4. Two-Component Aliphatic Polyurethane System (Clear): **[MPI RIN 6.5G]<Insert system description>** .
 - a. Prime Coat:
 - 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with topcoat.
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with topcoat.
 - 4) **<Insert manufacturer's name; product name or designation>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two-component [, **MPI #78**] .
 - 1) **<Insert manufacturer's name; product name or designation>** .
5. Moisture-Cured Polyurethane System (over Stain): **[MPI RIN 6.5L]<Insert system description>** .
 - a. Prime Coat:

- 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with stain, semi-transparent, for interior wood [, MPI #90] .
 - 3) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with stain, semi-transparent, for interior wood [, MPI #90] .
 - 4) <Insert manufacturer's name; product name or designation> .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Varnish, polyurethane, moisture cured, Gloss Level G6 [, MPI #31] .
- 1) <Insert manufacturer's name; product name or designation> .
- d. Stain Color: [As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule on Drawings]<Insert requirements> .

F. Plaster Substrates:

1. Latex System over Waterborne Primer: [MPI RIN 9.2A]<Insert system description> system [over a transition coat] .
 - a. Prime Coat:
 - 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with primer sealer, latex, interior [, MPI #50] .
 - 3) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with primer, stain blocking, water based [, MPI #137] .
 - 4) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with primer sealer, latex, interior [, MPI #50] .
 - 5) For [MPI DSD 3]<Insert designation> degree of surface degradation, fully prime coat with primer, stain blocking, water based [, MPI #137] .
 - 6) <Insert manufacturer's name; product name or designation> .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat:
 - 1) Latex, interior, Gloss Level G1 [, MPI #53] .
 - 2) Latex, interior, Gloss Level G2 [, MPI #44] .
 - 3) Latex, interior, Gloss Level G3 [, MPI #52] .
 - 4) Latex, interior, Gloss Level G4 [, MPI #43] .
 - 5) Latex, interior, Gloss Level G5 [, MPI #54] .
 - 6) Latex, interior, Gloss Level G6 [, MPI #114] .
 - 7) <Insert manufacturer's name; product name or designation> .
2. Low-Odor Latex System over Waterborne Primer: [MPI RIN 9.2M]<Insert system description> system [over a transition coat] .
 - a. Prime Coat:
 - 1) For [MPI DSD 1]<Insert designation> degree of surface degradation, touch up with topcoat.
 - 2) For [MPI DSD 2]<Insert designation> degree of surface degradation, spot prime with primer sealer, latex, interior [, MPI #50] .

- 3) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, stain blocking, water based [, **MPI #137**] .
 - 4) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer sealer, latex, interior [, **MPI #50**] .
 - 5) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, stain blocking, water based [, **MPI #137**] .
 - 6) **<Insert manufacturer's name; product name or designation>** .
- b. Topcoat:
- 1) Latex, interior, institutional low odor/VOC, Gloss Level G1 [, **MPI #143**] .
 - 2) Latex, interior, institutional low odor/VOC, Gloss Level G2 [, **MPI #144**] .
 - 3) Latex, interior, institutional low odor/VOC, Gloss Level G3 [, **MPI #145**] .
 - 4) Latex, interior, institutional low odor/VOC, Gloss Level G4 [, **MPI #146**] .
 - 5) Latex, interior, institutional low odor/VOC, Gloss Level G5 [, **MPI #147**] .
 - 6) Latex, interior, institutional low odor/VOC, Gloss Level G6 [, **MPI #148**] .
 - 7) **<Insert manufacturer's name; product name or designation>** .
3. Latex System over Alkyd Primer: **[MPI RIN 9.2K]<Insert system description>** system [**over a transition coat**] .
- a. Prime Coat:
- 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer sealer, alkyd, interior [, **MPI #45**] .
 - 3) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat primer sealer, alkyd, interior [, **MPI #45**] .
 - 4) **<Insert manufacturer's name; product name or designation>** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat:
- 1) Latex, interior, Gloss Level G1 [, **MPI #53**] .
 - 2) Latex, interior, Gloss Level G2 [, **MPI #44**] .
 - 3) Latex, interior, Gloss Level G3 [, **MPI #52**] .
 - 4) Latex, interior, Gloss Level G4 [, **MPI #43**] .
 - 5) Latex, interior, Gloss Level G5 [, **MPI #54**] .
 - 6) **<Insert manufacturer's name; product name or designation>** .
4. Alkyd System: **[MPI RIN 9.2C]<Insert system description>** system [**over a transition coat**] .
- a. Prime Coat:
- 1) For **[MPI DSD 1]<Insert designation>** degree of surface degradation, touch up with topcoat.
 - 2) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer sealer, latex, interior [, **MPI #50**] .
 - 3) For **[MPI DSD 2]<Insert designation>** degree of surface degradation, spot prime with primer, stain blocking, water based [, **MPI #137**] .
 - 4) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer sealer, latex, interior [, **MPI #50**] .
 - 5) For **[MPI DSD 3]<Insert designation>** degree of surface degradation, fully prime coat with primer, stain blocking, water based [, **MPI #137**] .



6) <Insert manufacturer's name; product name or designation> .

b. Intermediate Coat: Matching topcoat.

c. Topcoat:

1) Alkyd, interior, Gloss Level G1 [, **MPI #49**] .

2) Alkyd, interior, Gloss Level G3 [, **MPI #51**] .

3) Alkyd, interior, Gloss Level G5 [, **MPI #47**] .

4) Alkyd, interior, Gloss Level G6 [, **MPI #48**] .

5) <Insert manufacturer's name; product name or designation> .

END OF SECTION 09 01 90 52



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Task	Specification	Specification Description
09 01 90 52	03 01 30 00	Maintenance of Cast-in-Place Concrete



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SECTION 09 05 61 13 - MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. MVE-control system - fluid applied.
 - 2. MVE-control system - sheet membranes.

1.2 ALLOWANCES

- A. Concrete MVE-control systems are part of **[Moisture Vapor Emission Control Allowance]<Insert allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by **[Moisture Vapor Emission Control Unit Price]<Insert unit price>**.

1.4 DEFINITIONS

- A. MVE: Moisture vapor emission per ASTM F710, a term used by the flooring industry in the United States to measure moisture emission from concrete floors in pounds per 1000 sq. ft. during a 24-hour period (56.51 µg/(s m²) using the anhydrous calcium chloride test.
- B. MVER: Moisture vapor emission rate per ASTM F1869, a term used to indicate the amount of water vapor in pounds emitted from a 1000 sq. ft. area of concrete flooring during a 24-hour period.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For waterproofing, providing information for testing in compliance with ASHRAE 160-2016.2009.
 - 2. Product Data: For waterproofing, providing information for testing in compliance with CCR, Title 24, Part 2, Section 1202 and Ch. 14.
 - 3. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
 - 4. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

09 - Finishes

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each MVE-control system, for tests performed by **[manufacturer and witnessed by a qualified testing agency][a qualified testing agency]**.
- B. Preinstallation testing reports.
- C. Field quality control reports.
- D. Qualification Statements: For **[Installer][manufacturer]**.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Employs factory-trained personnel who are available for consultation and Project-site inspection.
- B. Installer Qualifications: **[Fabricator of products][Entity that employs installers and supervisors who are trained and approved by manufacturer][Authorized representative who is trained and approved by manufacturer]**.

1.9 MOCKUPS

- A. Build mockups **[to verify selections made under Sample submittals][to demonstrate aesthetic effects][to set quality standards for materials and execution][to set quality standards for fabrication and installation][and][for preconstruction testing]**.
 - 1. Build mockup **[as indicated on Drawings][as directed by Architect]<Insert mockup requirements>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.
 - 1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than **65 deg F (18 deg C)** and not more than **85 deg F (29.4 deg C)** at least 48 hours before use.
 - 2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than **65 deg F (18 deg C)** or more than **85 deg F (29.4 deg C)** and not less than 40 or more than 60 percent relative

- humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
3. Install MVE-control systems where concrete surface temperatures will remain a minimum of **5 deg F (3 deg C)** higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

1.12 WARRANTY

- A. Special Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace the floor covering materials or floor coatings and the applied moisture vapor emission control system, that fails in materials and or workmanship within specified warranty period.
 1. Warranty Period: **[5][10][20]<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:
 1. MVER: Maximum **[15 lb of water/1000 sq. ft. (6.80 kg of water/92.9 sq. m)][25 lb of water/1000 sq. ft. (11.34 kg of water/92.9 sq. m)][30 lb of water/1000 sq. ft. (13.61 kg of water/92.9 sq. m)]<Insert rate>** when tested in accordance with ASTM F1869.
 2. Relative Humidity: Maximum **[100][90]<Insert number>** percent when tested in accordance with ASTM F2170 using in situ probes.
- B. Water-Vapor Transmission: Through MVE-control system, maximum **[0.10 perm (5.75 ng/Pa x s x sq. m)][0.02 perm (1.15 ng/Pa x s x sq. m)][0.05 perm (2.86 ng/Pa x s x sq. m)][0.06 perm (3.45 ng/Pa x s x sq. m)]** when tested in accordance with ASTM E96/E96M.
- C. Tensile Bond Strength: For MVE-control system, greater than **[200 psi (1.38 MPa)]<Insert pressure>** with failure in the concrete in accordance with ASTM D7234.

2.2 MVE-CONTROL SYSTEM - FLUID APPLIED

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Advanced Moisture Control, Inc.]**
 2. **[ARDEX Americas]**
 3. **[Custom Building Products]**
 4. **[Dependable, LLC]**
 5. **[Floor Seal Technology, Inc.]**
 6. **[H.B. Fuller Construction Products Inc. / TEC]**
 7. **[KOSTER American Corporation]**
 8. **[Laticrete International, Inc.]**
 9. **[MAPEI Corporation]**

10. [Maxxon Corporation]
11. [Schonox HPS North America, Inc.]
12. [Synthetics International]
13. [USG Corporation]
14. [Uzin Utz North America, Inc.]
15. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Advanced Moisture Control, Inc.]
2. [ARDEX Americas]
3. [Custom Building Products]
4. [Dependable, LLC]
5. [Floor Seal Technology, Inc.]
6. [H.B. Fuller Construction Products Inc. / TEC]
7. [KOSTER American Corporation]
8. [Laticrete International, Inc.]
9. [MAPEI Corporation]
10. [Maxxon Corporation]
11. [Schonox HPS North America, Inc.]
12. [Synthetics International]
13. [USG Corporation]
14. [Uzin Utz North America, Inc.]
15. <Insert manufacturer's name>

C. MVE-Control System:

1. ASTM F3513 compliant-qualified, fluid-applied, single-component, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
2. ASTM F3010 compliant-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
3. Water-based epoxy, fluid-applied, [single][two]-component, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
4. Polyurethane resin, fluid-applied, [single][two]-component, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
5. Acrylic-based, fluid-applied, [two][three]-component, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
6. Silicate-based, fluid-applied, single-component, membrane-forming system; formulated for application on [new][and][existing] concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
7. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

8. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
9. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.3 MVE-CONTROL SYSTEM - SHEET MEMBRANES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 1. **<Insert manufacturer's name>.**
- B. MVE-Control System: Sheet membrane, mold and fungal resistance per ASTM D3273, loose laid applied system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.

2.4 ACCESSORIES

- A. Patching and Repair Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of **[3000 psi (20.68 MPa)]<Insert pressure>** compressive strength after 28 days when tested in accordance with ASTM C109/C109M.
- B. Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of **[3000 psi (20.68 MPa)]<Insert pressure>** compressive strength after 28 days when tested in accordance with ASTM C109/C109M.
- C. Crack and Joint Repair Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.
- D. Substrate Primer: Provide MVE-control system manufacturer's substrate primer if required for system indicated by substrate conditions. Ensure adhesion of products to MVE-control system.
- E. Cementitious Underlayment: **[Gypsum][Hydraulic]** cement-based underlayment. Provide product as recommended by MVE-control system manufacturer.
- F. Seam Tapes: Double-sided tape to adhere to concrete surface and MVE-control sheet membrane surface with seal tape for seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the

Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Preinstallation Testing:

1. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests.
2. Alkalinity Testing: Perform pH testing in accordance with flooring manufacturer's written instructions or, in the absence thereof, in accordance with ASTM F3441. Install MVE-control system in areas where pH readings are outside the acceptable range of the flooring materials to be installed.
3. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert dimension>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Install MVE-control system in locations where concrete substrate MVER exceeds flooring manufacturer's published limits.
 - b. Internal Relative Humidity Test: Using in situ probes, ASTM F2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity levels that exceed flooring manufacturer's published limits.
4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum **[100-sq. ft. (9.29-sq. m)]<Insert dimension>** area of MVE-control system to prepared concrete substrate and test in accordance with ASTM D7234.
 - a. Proceed with installation only where tensile bond strength is greater than **[200 psi (1.38 MPa)]<Insert pressure>** with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates in accordance with MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.

1. Remove coatings and other substances that are incompatible with MVE-control system and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control system manufacturer. Do not use solvents.
2. Provide concrete surface profile CSP as described within ICRI 310.2R as required by the MVE control system, if any, by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
3. After shot blasting, repair damaged and deteriorated concrete in accordance with MVE-control system manufacturer's written instructions.
4. Protect substrate voids and joints to prevent resins from flowing into or leaking through them.
5. Fill surface depressions and irregularities with patching and repair material.
6. Fill surface cracks, grooves, control joints, and other nonmoving joints with crack-filling material.
7. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control system manufacturer after surface preparation, but not less than 24 hours.
8. Before installing MVE-control systems, broom sweep and vacuum prepared concrete.

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION OF MVE-CONTROL SYSTEM - FLUID APPLIED

- A. Confirm that Architect approved mockups.
- B. Install MVE-control system - fluid applied in accordance with ASTM F3010 or ASTM F3513 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fisheyes, and voids.
 - 1. Install primers as required to comply with manufacturer's written instructions.
- C. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.
- D. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.
- E. Cure MVE-control system components in accordance with manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.
- F. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies in accordance with manufacturer's written instructions.
- G. Install cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.4 INSTALLATION OF MVE-CONTROL SYSTEM - SHEET MEMBRANES

- A. Install MVE-control system - sheet membrane in accordance with manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fisheyes, and voids.
 - 1. Install seam tapes required to comply with manufacturer's written instructions.
 - 2. Per floor covering manufacturer's written instructions, finished floor covering requires at least 48 hours of acclimation in order to minimize expansion and contraction after installation. Do not install floor covering until proper acclimation occurs.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform installation inspections.
- B. Installation Inspections: Inspect substrate preparation and installation of system components to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control system is installed without deficiencies.
 - 1. Verify that surface preparation meets requirements.
 - 2. Verify that component coats and complete MVE-control-system film thicknesses comply with manufacturer's written instructions.
 - 3. Verify that MVE-control-system components and installation areas that evidence deficiencies are repaired in accordance with manufacturer's written instructions.
- C. MVE-control system will be considered defective if it does not pass inspections.



3.6 PROTECTION

- A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.
- B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION 09 05 61 13



Task	Specification	Specification Description
09 05 71 00	09 30 13 00	Ceramic Tiling



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SECTION 09 22 13 13 - GYPSUM VENEER PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum veneer plaster.
2. Panel products.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-load-bearing steel framing.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Gypsum veneer plaster.
2. Panel products.

B. Shop Drawings:

1. Show locations, fabrication, and installation of control joints, reveals, and trim; include plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in **10-inch (250-mm)** length for each trim accessory.
2. Textured Finishes: **[Manufacturer's standard size]**<Insert size> for each textured finish and on rigid backing.

D. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
3. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.
4. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
5. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
6. Product Data: For adhesives and sealants, indicating VOC content.
7. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

8. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
9. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
10. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

1.3 MOCKUPS

- A. Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
 2. Provide mockups of **[ceilings][and][partitions]** in sizes of at least **100 sq. ft. (9 sq. m)**.
 3. Apply gypsum veneer plaster, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C843 requirements or gypsum veneer plaster manufacturer's written recommendations, whichever are more stringent.
- B. Room Temperatures: Maintain not less than **55 deg F (13 deg C)** or more than **80 deg F (27 deg C)** for seven days before application of **[gypsum base and]**gypsum veneer plaster, continuously during application, and after application until veneer plaster is dry.
- C. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
 1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
 2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.
- D. Do not install panels that are wet, moisture damaged, mold damaged, or faded from overexposure to sunlight.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain gypsum veneer plaster products, including gypsum base for veneer plaster, joint reinforcing tape, and embedding material, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- F. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 GYPSUM VENEER PLASTER

- A. One-Component Gypsum Veneer Plaster: ASTM C587, ready-mixed, smooth, finish-coat veneer plaster formulated for application directly over substrate without use of separate base-coat material.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Georgia-Pacific Gypsum LLC]**
 - b. **[USG Corporation]**

- c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Georgia-Pacific Gypsum LLC]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
- B. High-Strength, One-Component Gypsum Veneer Plaster: ASTM C587, ready-mixed, smooth, finish-coat veneer plaster containing mill-mixed, fine silica sand; with a compressive strength of **3000 psi (20 MPa)** when tested in accordance with ASTM C472; and formulated for application directly over substrate without use of separate base-coat material.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
- C. Two-Component Gypsum Veneer Plaster: ASTM C587, with separate formulations; one for base-coat application and one for finish-coat application over substrates.
 1. Base Coat:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 2. Smooth Finish Coat:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**

following]:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

3. Textured Finish Coat:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

- D. High-Strength, Two-Component Gypsum Veneer Plaster: ASTM C587, ready-mixed, base-coat plaster and smooth finish-coat veneer plaster containing mill-mixed, fine silica sand; with a compressive strength of **3000 psi (20 MPa)** when tested in accordance with ASTM C472.

1. Base Coat, High Strength:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [USG Corporation]
- 2) <Insert manufacturer's name>

2. Smooth Finish Coat, High Strength:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) **[USG Corporation]**
- 2) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
- E. Radiant-Heat, Two-Component Gypsum Veneer Plaster: ASTM C587 and approved in writing by gypsum veneer plaster manufacturer for application with embedded electric heating cables.
 1. Base Coat for Radiant Heat:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 2. Finish Coat for Radiant Heat:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[USG Corporation]**
 - 2) **<Insert manufacturer's name>**
 3. Provide **[ready-mixed][or][job-aggregated]** components, as standard for manufacturer, to comply with manufacturer's written recommendations.
 4. Aggregate: For job-aggregated, **[base coat][and]** texture finish coat, provide white silica sand passing a **No. 30 (0.6-mm)** sieve.

2.4 PANEL PRODUCTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Panel Size: Provide panels in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- H. Gypsum Base for Veneer Plaster: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Continental Building Products Inc.]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Continental Building Products Inc.]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
 - 3. Thickness: **[1/2 inch (12.7 mm)][As indicated]<Insert thickness>**.
- I. Gypsum Base for Veneer Plaster, Type X: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Gypsum]
- b. [CertainTeed; SAINT-GOBAIN]
- c. [Continental Building Products Inc.]
- d. [Georgia-Pacific Gypsum LLC]
- e. [USG Corporation]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [American Gypsum]
- b. [CertainTeed; SAINT-GOBAIN]
- c. [Continental Building Products Inc.]
- d. [Georgia-Pacific Gypsum LLC]
- e. [USG Corporation]
- f. <Insert manufacturer's name>

3. Thickness: [5/8 inch (15.9 mm)][3/4 inch (19.0 mm)][As indicated]<Insert dimension>.

- J. Gypsum Base for Veneer Plaster, Type C: ASTM C1396/C1396M. Manufactured to have increased fire-resistive capability.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [CertainTeed; SAINT-GOBAIN]
- b. [USG Corporation]
- c. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [CertainTeed; SAINT-GOBAIN]
- b. [USG Corporation]
- c. <Insert manufacturer's name>

3. Thickness: [1/2 inch (12.7 mm)][As indicated]<Insert dimension>.

- K. Foil-Backed Gypsum Base for Veneer Plaster: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [USG Corporation]
- b. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 3. Thickness: **[1/2 inch (12.7 mm)][As indicated]<Insert dimension>**.
- L. Abuse-Resistant Gypsum Base for Veneer Plaster: With specially reinforced core for greater resistance to surface abrasion, indentation, soft-body impact, and hard-body impact.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 3. Core: **[1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X][As indicated]<Insert thickness and type>**.
 4. Long Edges: Tapered.
 5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 6. Abuse Resistance: ASTM C1629/C1629M, **[Level 1][Level 2][Level 3]**.
- M. Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M. With moisture- and mold-resistant core; **[non-rated][fire-resistive rated]**; glass-mat facing on both sides of panel.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Georgia-Pacific Gypsum LLC]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Georgia-Pacific Gypsum LLC]**
 - b. **<Insert manufacturer's name>**
 3. Core: **[1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type X][5/8 inch (15.9 mm), Type X]**.
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- N. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 and approved by backer unit manufacturer

for use as veneer plaster substrate.

1. Thickness: **[1/2 inch (12.7 mm)][As indicated]<Insert dimension>**.
2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

- O. Backing Panels for Multilayer Applications: ASTM C1396/C1396M gypsum base or gypsum board, as recommended by gypsum veneer plaster manufacturer, for application method and thicknesses indicated.

1. Core: Matching face layer unless otherwise indicated.
2. Thickness: Matching face layer unless otherwise indicated.

2.5 TRIM ACCESSORIES

- A. Standard Trim: ASTM C1047, provided or approved by manufacturer for use in gypsum veneer plaster applications indicated.

1. Material: **[Galvanized-steel sheet or aluminum-coated steel sheet; rolled zinc, plastic, or paper-faced galvanized-steel sheet][Galvanized-steel sheet, aluminum-coated steel sheet, or rolled zinc][Plastic][Paper-faced, galvanized-steel sheet]**.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives veneer plaster.
 - d. L-Bead: L-shaped; exposed long flange receives veneer plaster.
 - e. U-Bead: J-shaped; exposed short flange does not receive veneer plaster.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.
 - g. Control joints.

- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Flannery, Inc.]**
 - b. **[Fry Reglet Corporation]**
 - c. **[Gordon Inc.]**
 - d. **[Pittcon Industries]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flannery, Inc.]**
 - b. **[Fry Reglet Corporation]**
 - c. **[Gordon Inc.]**
 - d. **[Pittcon Industries]**
 - e. **<Insert manufacturer's name>**

3. Aluminum: Alloy and temper with not less than the strength and durability properties of

ASTM B221 (ASTM B221M), Alloy 6063-T5.

4. Finish: **[Corrosion-resistant primer compatible with veneer plaster]<Insert requirements for Class II anodic finishes and factory-painted, baked-enamel finishes>.**

2.6 JOINT-REINFORCING MATERIALS

- A. General: Comply with joint strength requirements in ASTM C587 and with gypsum veneer plaster manufacturer's written recommendations for each application indicated.
- B. Joint Tape:
 1. Gypsum Base for Veneer Plaster: **[As recommended by gypsum veneer plaster manufacturer for applications indicated][Paper][Open-mesh, glass fiber].**
 2. Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
- C. Embedding Material for Joint Tape:
 1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for use with joint-tape material and gypsum veneer plaster applications indicated.
 2. Cementitious Backer Units: As recommended by cementitious backer unit manufacturer for applications indicated.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Bonding Agent: ASTM C631 polyvinyl acetate.
- C. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum-base, face-layer panels to backing-layer panels in multilayer construction.
 1. Adhesives shall have a VOC content of **[50]<Insert value> g/L** or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- D. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
- E. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- F. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- G. Acoustical Joint Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- H. Patching Mortar: Dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a **No. 16 (1.18-mm)** sieve, using only enough water for handling and placing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Radiant-Heat Gypsum Veneer Plaster Ceilings: Examine electric heating cables prior to application of veneer plaster to verify that cables are countersunk or, if surface mounted, do not sag below ceiling substrate and are securely attached and installed taut.
- D. Masonry Substrates: Verify that mortar joints are struck flush.

- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Monolithic Concrete Substrates: Prepare according to gypsum veneer plaster manufacturer's written recommendations and as follows:
 - 1. Clean surfaces to remove dust, loose particles, grease, oil, incompatible curing compounds, form-release agents, and other foreign matter and deposits that could impair bond with gypsum veneer plaster.
 - 2. Remove ridges and protrusions greater than **1/8 inch (3 mm)** and fill depressions greater than **1/4 inch (6.4 mm)** with patching mortar. Allow to set and dry.
 - 3. Apply bonding agent on dry and cured concrete substrates.
- B. Masonry Substrates: Prepare according to gypsum veneer plaster manufacturer's written recommendations and as follows:
 - 1. Clean surfaces to remove dirt, grease, oil, and other foreign matter and deposits that could impair bond with gypsum veneer plaster.
 - 2. Apply bonding agent on dry masonry substrates.

3.3 INSTALLATION OF PANEL PRODUCTS

- A. Gypsum Base for Veneer Plaster: Apply in accordance with ASTM C844 unless manufacturer's written recommendations are more stringent.
 - 1. Do not allow gypsum base to degrade from exposure to sunlight, as evidenced by fading of paper facing.
 - 2. Erection Tolerance: No more than **1/16-inch (1.6-mm)** offsets between planes of gypsum base panels, and **1/8 inch in 8 feet (3 mm in 2.4 m)** noncumulative, for level, plumb, warp, and bow.
- B. Install sound attenuation blankets before installing gypsum base for veneer plaster.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.6 mm)** of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not locate joints, other than control joints, at corners of framed openings.
- F. Attach panels to steel studs, so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach panels to framing provided at openings and cutouts.
- H. Form control joints with space between edges of adjoining panels.
- I. Cover both sides of partition framing with panels in concealed spaces, including above ceilings, except

in internally braced chases.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.74 sq. m)** in area.
 2. Fit panels around ducts, pipes, and conduits.
 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut panels to fit profile formed by coffers, joists, and other structural members; allow **1/4- to 3/8-inch- (6.4- to 9.5-mm-)** wide joints; seal joints with acoustical sealant.
- J. Wood Framing: Install panels over wood framing, with "floating" internal corner construction. Do not attach panels across the flat grain of wide-dimension lumber, including floor joists and headers. "Float" panels over these members or provide control joints to counteract wood shrinkage.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- L. Fastener Spacing: Comply with ASTM C844, manufacturer's written recommendations, and fire-resistance-rating requirements.
1. Space screws a maximum of **12 inches (305 mm)** o.c. along framing members for wall or ceiling application.
 2. Space fasteners in cementitious backer units a maximum of **[8 inches (200 mm) o.c. along framing members for wall applications][and][6 inches (150 mm) o.c. along framing members for ceiling applications]**.
- M. Install panels for veneer plaster in locations indicated on Drawings.
- N. Single-Layer Application:
1. On ceilings, apply gypsum base panels before wall panels, to the greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On walls, apply gypsum base panels **[vertically and parallel][horizontally and perpendicular]** to framing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other walls higher than **30 feet (9.0 m)**, install gypsum base panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring, apply gypsum base panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- O. Multilayer Application on Ceilings: Apply backing panels for ceilings before applying backing panels for partitions; apply gypsum-base face layers in same sequence. Apply backing panels at right angles to framing members and offset gypsum-base, face-layer joints a minimum of **16 inches (400 mm)** from parallel backing panel joints unless otherwise required by fire-resistance-rated assembly.
- P. Multilayer Application on Partitions: Apply backing panels indicated and gypsum-base face layers vertically (parallel to framing), with joints of backing panels located over stud or furring members and gypsum-base, face-layer joints offset at least one stud or furring member from backing-panel joints,

unless otherwise required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

1. Z-Furring: Apply backing panels vertically (parallel to framing) and gypsum-base face layer either vertically or horizontally (perpendicular to framing), with vertical joints offset at least one furring member. Locate edge joints of backing panels over furring members.
- Q. Fasteners: Drive fasteners flush with gypsum base surface. Do not overdrive fasteners or cause surface depressions.
- R. Single-Layer Fastening Methods: Apply gypsum base panels to supports with steel drill screws.
- S. Multilayer Fastening Methods: Fasten backing panels **[and gypsum-base face layers separately to supports with screws][with screws; fasten gypsum-base face layers with adhesive and supplementary fasteners]**.
- T. Curved Surfaces: Comply with gypsum base manufacturer's written installation recommendations.
- U. Cementitious Backer Units: Install in accordance with ANSI A108/A118/A136.
 1. Where cementitious backer units abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.4 INSTALLATION OF TRIM ACCESSORIES

- A. General: Install trim with back flanges intended for fasteners, and attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install **[at locations indicated on Drawings][in accordance with ASTM C844 and in specific locations approved by Architect]**.
- C. Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners **[unless otherwise indicated]**.
 2. Bullnose Bead: Use **[at outside corners][where indicated]<Insert requirements>**.
 3. LC-Bead: Use **[at exposed panel edges]<Insert requirements>**.
 4. L-Bead: Use **[where indicated]<Insert requirements>**.
 5. U-Bead: Use **[at exposed panel edges][where indicated]<Insert requirements>**.
 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim:
 1. Apply and embed joint tape over flanges of aluminum trim accessories if recommended by trim manufacturer.

3.5 INSTALLATION OF JOINT REINFORCEMENT

- A. Gypsum Base: Reinforce interior angles and flat joints with joint tape and embedding material to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.
- B. Abuse-Resistant Base: Reinforce joints between abuse-resistant panels with joint tape and embedding material according to panel manufacturer's written recommendations.

- C. Glass-Mat Interior Gypsum Board: Reinforce joints between moisture- and mold-resistant panels with joint tape and embedding material according to panel manufacturer's written recommendations.
- D. Cementitious Backer Units: Reinforce joints between cementitious backer units with joint tape and embedding material according to unit manufacturer's written recommendations.

3.6 APPLICATION OF GYPSUM VENEER PLASTER

- A. Bonding Agent: Apply bonding agent on dry **[monolithic concrete][masonry][abuse-resistant base panels][cementitious backer units]<Insert substrate>** according to gypsum veneer plaster manufacturer's written recommendations.
- B. Gypsum Veneer Plaster Mixing: Mechanically mix gypsum veneer plaster materials to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.
- C. Gypsum Veneer Plaster Application: Comply with ASTM C843 and with veneer plaster manufacturer's written recommendations.
 - 1. One-Component Gypsum Veneer Plaster: Trowel apply plaster over substrate to uniform thickness. Fill all voids and imperfections. Immediately double back with same mixer batch of plaster to a uniform total thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**.
 - 2. Two-Component Gypsum Veneer Plaster:
 - a. Base Coat: Hand trowel or machine apply base coat over substrate to a uniform thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**. Fill voids and imperfections.
 - b. Finish Coat: Trowel apply finish-coat plaster over base-coat plaster to a uniform thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**.
 - 3. Where gypsum veneer plaster abuts metal, including doorframes, windows and other units, groove finish coat to eliminate spalling.
 - 4. Do not apply veneer plaster to gypsum base if paper facing has degraded from exposure to sunlight. Before applying veneer plaster, use remedial methods to restore bonding capability to degraded paper facing according to manufacturer's written recommendations **[and as approved by Architect]**.
- D. Radiant-Heat, Two-Component Gypsum Veneer Plaster Ceilings: Comply with ASTM C843 and with radiant-heat veneer plaster manufacturer's written recommendations.
 - 1. Base Coat: Apply plaster base coat to sufficiently cover electric heating cables. Trowel plaster parallel in direction of cables to a uniform thickness of **3/16 inch (4.8 mm)**. Completely cover cables.
 - 2. Finish Coat: After base coat has developed sufficient bond, apply finish coat. Trowel plaster to a uniform thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**.
- E. Concealed Surfaces: Do not omit gypsum veneer plaster behind cabinets, furniture, furnishings, and similar removable items. Omit veneer plaster in the following areas where it will be concealed from view in the completed Work unless otherwise indicated or required to maintain fire-resistance and STC ratings:
 - 1. Above suspended ceilings.
 - 2. Behind wood paneling.
 - 3. **<Insert requirements>**.
- F. Gypsum Veneer Plaster Finish: **[Smooth-troweled finish unless otherwise indicated][Textured**

finish matching Architect's sample and approved mockups]<Insert textured finish requirements>.

3.7 PROTECTION

- A. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.
- B. Remove and replace gypsum veneer plaster and gypsum base panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that gypsum base panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that gypsum base panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 22 13 13



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Task	Specification	Specification Description
09 22 13 13	09 23 00 00	Gypsum Plastering
09 22 13 23	09 23 00 00	Gypsum Plastering
09 22 13 23	09 22 13 13	Gypsum Veneer Plastering



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SECTION 09 22 16 00 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstructural steel framing.
2. Grid suspension systems.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing, structural framing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site][by web conference]<Insert location>** .

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of nonstructural steel framing and fastening and anchorage details.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, and attachments to adjoining work.

C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For code-compliance certification of studs and track.

- B. Evaluation Reports: From **[an agency acceptable to authorities having jurisdiction][ICC-ES]<Insert evaluation agency>** showing compliance with Project requirements, for the following:

1. Studs and track.
2. High-strength steel studs and track.
3. Equivalent corrosion-resistant coating on steel framing.



4. Firestop track.
5. Post-installed anchors.
6. Power-actuated anchors.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Track: Provide documentation that framing members are certified in accordance with product-certification program of **[the Steel Framing Industry Association][the Steel Stud Manufacturers Association][or][the Supreme Steel Framing System Association]** .

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect materials from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For **[composite][non-composite]** wall assemblies, limited to **[1/240][1/360]<Insert requirements>** of the wall height based on the following horizontal loading:
 1. Horizontal Loading: **[As indicated on Drawings][5 lbf/sq. ft. (240 Pa)][10 lbf/sq. ft. (480 Pa)]<Insert value>** .

2.2 NONSTRUCTURAL STEEL FRAMING

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with requirements in AISI S220 for conditions indicated on Drawings.
 1. Protective Coating: ASTM A653/A653M, **[G40 (Z120)][G60 (Z180)]** hot-dip galvanized or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.
 - a. Equivalent Corrosion-Resistant Coating: Evaluation report acceptable to authorities having

jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.

- C. Studs and Track: Conventional members, roll-formed into standard shapes without surface deformations to stiffen framing members.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CEMCO; California Expanded Metal Products Co.]**
 - b. **[ClarkDietrich]**
 - c. **[CRACO Mfg., Inc.]**
 - d. **[Jaimes Industries, Inc.]**
 - e. **[MarinoWARE]**
 - f. **[MBA Building Supplies]**
 - g. **[MBA Metal Framing]**
 - h. **[MRI Steel Framing, LLC]**
 - i. **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - j. **[Steel Construction Systems; Stone Group of Companies]**
 - k. **[Steel Network, Inc. (The)]**
 - l. **[TELLING Industries]**
 - m. **[UMS Metal Building Systems USA LLC]**
 - n. **[US Frame Factory]**
 - o. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CEMCO; California Expanded Metal Products Co.]**
 - b. **[ClarkDietrich]**
 - c. **[CRACO Mfg., Inc.]**
 - d. **[Jaimes Industries, Inc.]**
 - e. **[MarinoWARE]**
 - f. **[MBA Building Supplies]**
 - g. **[MBA Metal Framing]**
 - h. **[MRI Steel Framing, LLC]**
 - i. **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - j. **[Steel Construction Systems; Stone Group of Companies]**
 - k. **[Steel Network, Inc. (The)]**
 - l. **[TELLING Industries]**
 - m. **[UMS Metal Building Systems USA LLC]**
 - n. **[US Frame Factory]**
 - o. **<Insert manufacturer's name>**
3. Minimum Base-Steel Thickness: **[As indicated on Drawings][As required by performance requirements for horizontal deflection][0.0179 inch (0.455 mm)][0.0296 inch (0.752 mm)]** .
4. Minimum Yield Strength: **33 ksi (230 MPa)**.
5. Depth: **[As indicated on Drawings][1-5/8 inches (41 mm)][2-1/2 inches (64 mm)][3-5/8 inches (92 mm)][4 inches (102 mm)][6 inches (152 mm)]<Insert dimension>** .

- D. High-Strength Steel Studs and Track: Roll-formed into proprietary shapes incorporating ribs, embossment, knurling, or dimensional changes to stiffen framing members.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [MarinoWARE]
- e. [MBA Building Supplies]
- f. [MBA Metal Framing]
- g. [MRI Steel Framing, LLC]
- h. [SCAFCO Steel Stud Company; Stone Group of Companies]
- i. [Steel Construction Systems; Stone Group of Companies]
- j. [TELLING Industries]
- k. [The Mill Steel Co]
- l. [US Frame Factory]
- m. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [MarinoWARE]
- e. [MBA Building Supplies]
- f. [MBA Metal Framing]
- g. [MRI Steel Framing, LLC]
- h. [SCAFCO Steel Stud Company; Stone Group of Companies]
- i. [Steel Construction Systems; Stone Group of Companies]
- j. [TELLING Industries]
- k. [The Mill Steel Co]
- l. [US Frame Factory]
- m. <Insert manufacturer's name>

3. Minimum Base-Steel Thickness and Yield Strength: [As indicated on Drawings][As required by horizontal deflection performance requirements][As required to provide equivalent capacity to conventional stud and track members specified and indicated on Drawings][0.0147 inch (0.373 mm) and 50 ksi (345 MPa)][0.0179 inch (0.455 mm) and 57 ksi (390 MPa)]<Insert requirements> .
4. Depth: [As indicated on Drawings][1-5/8 inches (41 mm)][2-1/2 inches (64 mm)][3-5/8 inches (92 mm)][4 inches (102 mm)][6 inches (152 mm)]<Insert dimension> .

- E. Moisture-Barrier Bottom Track: Proprietary roll-formed steel shapes with ledges that lift finish panels 2 inches (51 mm) above the floor surface to prevent moisture damage.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [TELLING Industries]
- b. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[TELLING Industries]**
 - b. **<Insert manufacturer's name>**
3. Minimum Base-Steel Thickness: **[As indicated on Drawings][Matching studs][0.0179 inch (0.455 mm)][0.0296 inch (0.752 mm)]<Insert requirements>** .
4. Minimum Yield Strength: **33 ksi (230 MPa)**.
5. Depth: **[As indicated on Drawings][As required to accommodate studs]<Insert dimension>** .
6. Configuration: **[As indicated on Drawings]<Insert requirements>** .
7. Fire-Resistance-Rated Assemblies: Comply with requirements of assembly indicated on Drawings.

F. Slip-Type Head Joints: Where indicated on Drawings.

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to track.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[CEMCO; California Expanded Metal Products Co.]**
 - 2) **[ClarkDietrich]**
 - 3) **[CRACO Mfg., Inc.]**
 - 4) **[Marino\WARE]**
 - 5) **[MBA Metal Framing]**
 - 6) **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - 7) **[Steel Construction Systems; Stone Group of Companies]**
 - 8) **[Steel Network, Inc. (The)]**
 - 9) **[Super Stud Building Products Inc.]**
 - 10) **[US Frame Factory]**
 - 11) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[CEMCO; California Expanded Metal Products Co.]**
 - 2) **[ClarkDietrich]**
 - 3) **[CRACO Mfg., Inc.]**
 - 4) **[Marino\WARE]**
 - 5) **[MBA Metal Framing]**
 - 6) **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - 7) **[Steel Construction Systems; Stone Group of Companies]**
 - 8) **[Steel Network, Inc. (The)]**
 - 9) **[Super Stud Building Products Inc.]**
 - 10) **[US Frame Factory]**
 - 11) **<Insert manufacturer's name>**
 - c. Minimum Allowable Vertical Movement: **[1-1/2 inches (38 mm)][2 inches (51 mm)][2-1/2 inches (64 mm)][3 inches (76 mm)]<Insert dimension>** .

2. Single Long-Leg Track: Top track with solid, deep flanges in base-steel thickness not less than that of studs, installed with studs friction fit into track and with continuous bridging located within **12 inches (305 mm)** of the top of studs to provide lateral bracing.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[CEMCO; California Expanded Metal Products Co.]**
 - 2) **[ClarkDietrich]**
 - 3) **[Jaimes Industries, Inc.]**
 - 4) **[Marino\WARE]**
 - 5) **[MBA Building Supplies]**
 - 6) **[MRI Steel Framing, LLC]**
 - 7) **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - 8) **[Steel Construction Systems; Stone Group of Companies]**
 - 9) **[Steel Network, Inc. (The)]**
 - 10) **[TELLING Industries]**
 - 11) **[The Mill Steel Co]**
 - 12) **[US Frame Factory]**
 - 13) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[CEMCO; California Expanded Metal Products Co.]**
 - 2) **[ClarkDietrich]**
 - 3) **[Jaimes Industries, Inc.]**
 - 4) **[Marino\WARE]**
 - 5) **[MBA Building Supplies]**
 - 6) **[MRI Steel Framing, LLC]**
 - 7) **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - 8) **[Steel Construction Systems; Stone Group of Companies]**
 - 9) **[Steel Network, Inc. (The)]**
 - 10) **[TELLING Industries]**
 - 11) **[The Mill Steel Co]**
 - 12) **[US Frame Factory]**
 - 13) **<Insert manufacturer's name>**
 - c. Flange Length: **[2 inches (51 mm)][2-1/2 inches (64 mm)]<Insert dimension>** .
3. Slotted Deflection Track: Steel sheet top track manufactured with deep flanges that allow positive attachment to studs through long slots and prevent deflection of structure above from cracking finishes applied to framing; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[CEMCO; California Expanded Metal Products Co.]**
 - 2) **[ClarkDietrich]**

- 3) [Jaimes Industries, Inc.]
 - 4) [Marino\WARE]
 - 5) [MBA Building Supplies]
 - 6) [MRI Steel Framing, LLC]
 - 7) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 8) [Steel Construction Systems; Stone Group of Companies]
 - 9) [Steel Network, Inc. (The)]
 - 10) [TELLING Industries]
 - 11) [The Mill Steel Co]
 - 12) [US Frame Factory]
 - 13) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [CEMCO; California Expanded Metal Products Co.]
 - 2) [ClarkDietrich]
 - 3) [Jaimes Industries, Inc.]
 - 4) [Marino\WARE]
 - 5) [MBA Building Supplies]
 - 6) [MRI Steel Framing, LLC]
 - 7) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 8) [Steel Construction Systems; Stone Group of Companies]
 - 9) [Steel Network, Inc. (The)]
 - 10) [TELLING Industries]
 - 11) [The Mill Steel Co]
 - 12) [US Frame Factory]
 - 13) <Insert manufacturer's name>
- c. Flange Length: [2-1/2 inches (64 mm)]<Insert dimension> .
4. Double-Track System: Top outer track sized to friction-fit over inner track and inner track with deep flanges in base-steel thickness not less than that of studs and fastened to studs.
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
- 1) [ClarkDietrich]
 - 2) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 3) [Steel Construction Systems; Stone Group of Companies]
 - 4) [US Frame Factory]
 - 5) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [ClarkDietrich]
 - 2) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 3) [Steel Construction Systems; Stone Group of Companies]
 - 4) [US Frame Factory]
 - 5) <Insert manufacturer's name>

- c. Inner Track Flange Length: **[2 inches (51 mm)]<Insert dimension>** .
- G. Firestop Track: Top track manufactured to allow partition heads to expand and contract with movement of structure above while maintaining continuity of fire-resistance-rated assembly indicated on Drawings; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CEMCO; California Expanded Metal Products Co.]**
 - b. **[ClarkDietrich]**
 - c. **[Fire Trak Corp]**
 - d. **[MarinoWARE]**
 - e. **[Metal-Lite]**
 - f. **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - g. **[Steel Construction Systems; Stone Group of Companies]**
 - h. **[Steel Network, Inc. (The)]**
 - i. **[TELLING Industries]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CEMCO; California Expanded Metal Products Co.]**
 - b. **[ClarkDietrich]**
 - c. **[Fire Trak Corp]**
 - d. **[MarinoWARE]**
 - e. **[Metal-Lite]**
 - f. **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - g. **[Steel Construction Systems; Stone Group of Companies]**
 - h. **[Steel Network, Inc. (The)]**
 - i. **[TELLING Industries]**
 - j. **<Insert manufacturer's name>**
- H. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CEMCO; California Expanded Metal Products Co.]**
 - b. **[ClarkDietrich]**
 - c. **[Jaimes Industries, Inc.]**
 - d. **[MarinoWARE]**
 - e. **[MBA Building Supplies]**
 - f. **[MRI Steel Framing, LLC]**
 - g. **[Phillips Manufacturing Co]**
 - h. **[SCAFCO Steel Stud Company; Stone Group of Companies]**
 - i. **[Steel Construction Systems; Stone Group of Companies]**
 - j. **[Steel Network, Inc. (The)]**

- k. [TELLING Industries]
 - l. [The Mill Steel Co]
 - m. [US Frame Factory]
 - n. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [Jaimes Industries, Inc.]
 - d. [MarinoWARE]
 - e. [MBA Building Supplies]
 - f. [MRI Steel Framing, LLC]
 - g. [Phillips Manufacturing Co]
 - h. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - i. [Steel Construction Systems; Stone Group of Companies]
 - j. [Steel Network, Inc. (The)]
 - k. [TELLING Industries]
 - l. [The Mill Steel Co]
 - m. [US Frame Factory]
 - n. <Insert manufacturer's name>
3. Minimum Base-Steel Thickness: [As indicated on Drawings][0.0179 inch (0.455 mm)][0.0269 inch (0.683 mm)][0.0296 inch (0.752 mm)][0.0329 inch (0.836 mm)]<Insert thickness> .
- I. U-Channel: Cold-rolled steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
- a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [MarinoWARE]
 - f. [MBA Building Supplies]
 - g. [MRI Steel Framing, LLC]
 - h. [Phillips Manufacturing Co]
 - i. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - j. [Steel Construction Systems; Stone Group of Companies]
 - k. [Steel Network, Inc. (The)]
 - l. [TELLING Industries]
 - m. [The Mill Steel Co]
 - n. [UMS Metal Building Systems USA LLC]
 - o. [US Frame Factory]
 - p. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MRI Steel Framing, LLC]
- h. [Phillips Manufacturing Co]
- i. [SCAFCO Steel Stud Company; Stone Group of Companies]
- j. [Steel Construction Systems; Stone Group of Companies]
- k. [Steel Network, Inc. (The)]
- l. [TELLING Industries]
- m. [The Mill Steel Co]
- n. [UMS Metal Building Systems USA LLC]
- o. [US Frame Factory]
- p. <Insert manufacturer's name>

3. Depth:

- a. Bridging: **[As indicated on Drawings][1-1/2 inches (38 mm)]<Insert dimension>** .
- b. Suspended-Assembly Carrying Channels (Main Runners): **[As indicated on Drawings][2-1/2 inches (64 mm)][2 inches (51 mm)][1-1/2 inches (38 mm)]<Insert dimension>** .
- c. Suspended-Assembly Furring Channels (Furring Members): **[3/4 inch (19 mm)]<Insert dimension>** .

4. Bridging Clip Angle: Not less than **1-1/2 by 1-1/2 inches (38 by 38 mm); 0.068-inch- (1.73-mm-)** base-steel thickness.

J. Rigid Hat-Shaped Furring Channels: Conventional members, roll-formed into standard shapes.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MBA Metal Framing]
- h. [MRI Steel Framing, LLC]
- i. [Phillips Manufacturing Co]
- j. [SCAFCO Steel Stud Company; Stone Group of Companies]
- k. [Steel Construction Systems; Stone Group of Companies]
- l. [Steel Network, Inc. (The)]
- m. [TELLING Industries]
- n. [The Mill Steel Co]
- o. [UMS Metal Building Systems USA LLC]
- p. [US Frame Factory]
- q. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [MarinoWARE]
 - f. [MBA Building Supplies]
 - g. [MBA Metal Framing]
 - h. [MRI Steel Framing, LLC]
 - i. [Phillips Manufacturing Co]
 - j. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - k. [Steel Construction Systems; Stone Group of Companies]
 - l. [Steel Network, Inc. (The)]
 - m. [TELLING Industries]
 - n. [The Mill Steel Co]
 - o. [UMS Metal Building Systems USA LLC]
 - p. [US Frame Factory]
 - q. <Insert manufacturer's name>
3. Minimum Base-Steel Thickness: [As indicated on Drawings][0.0179 inch (0.455 mm)][0.0296 inch (0.752 mm)][0.0329 inch (0.836 mm)]<Insert thickness> .
 4. Depth: [As indicated on Drawings][7/8 inch (22.2 mm)][1-1/2 inches (38 mm)]<Insert requirements> .
- K. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [MarinoWARE]
 - f. [MBA Building Supplies]
 - g. [MRI Steel Framing, LLC]
 - h. [Phillips Manufacturing Co]
 - i. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - j. [Steel Construction Systems; Stone Group of Companies]
 - k. [Steel Network, Inc. (The)]
 - l. [TELLING Industries]
 - m. [The Mill Steel Co]
 - n. [US Frame Factory]
 - o. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]

- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MRI Steel Framing, LLC]
- h. [Phillips Manufacturing Co]
- i. [SCAFCO Steel Stud Company; Stone Group of Companies]
- j. [Steel Construction Systems; Stone Group of Companies]
- k. [Steel Network, Inc. (The)]
- l. [TELLING Industries]
- m. [The Mill Steel Co]
- n. [US Frame Factory]
- o. <Insert manufacturer's name>

3. Configuration: [Asymmetrical][or][hat shaped] .

L. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 3/4 inch (19 mm), minimum base-steel thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MBA Metal Framing]
- h. [MRI Steel Framing, LLC]
- i. [Phillips Manufacturing Co]
- j. [SCAFCO Steel Stud Company; Stone Group of Companies]
- k. [Steel Construction Systems; Stone Group of Companies]
- l. [Steel Network, Inc. (The)]
- m. [TELLING Industries]
- n. [The Mill Steel Co]
- o. [US Frame Factory]
- p. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MBA Metal Framing]
- h. [MRI Steel Framing, LLC]
- i. [Phillips Manufacturing Co]
- j. [SCAFCO Steel Stud Company; Stone Group of Companies]

- k. [Steel Construction Systems; Stone Group of Companies]
- l. [Steel Network, Inc. (The)]
- m. [TELLING Industries]
- n. [The Mill Steel Co]
- o. [US Frame Factory]
- p. <Insert manufacturer's name>

2.3 Auxiliary Materials - Steel Framing Connectors

- A. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1. <Insert manufacturer's name>

2.4 GRID SUSPENSION SYSTEMS

- A. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Armstrong World Industries]
- b. [CertainTeed; SAINT-GOBAIN]
- c. [Rockfon; ROCKWOOL International]
- d. [USG Corporation]
- e. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Armstrong World Industries]
- b. [CertainTeed; SAINT-GOBAIN]
- c. [Rockfon; ROCKWOOL International]
- d. [USG Corporation]
- e. <Insert manufacturer's name>

2.5 Flexible Backing Plate

- A. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1. <Insert manufacturer's name>

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Adjustable Wall-Furring Brackets: Steel sheet in minimum **0.0329-inch- (0.836-mm-)** base-steel thickness with serrated edges for attaching furring channels to exterior masonry or concrete walls.
 1. Protective Coating: ASTM A653/A653M, [**G40 (Z120)**][**or**][**G60 (Z180)**] , hot-dip galvanized.
- C. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 1. Tie Wire for Adjustable Wall-Furring Brackets: Use minimum double strand of **0.0625-inch- (1.59-mm-)** diameter wire, or triple strand of **0.0475-inch- (1.21-mm-)** diameter wire to attach furring channels.
 2. Tie Wire for Suspended-Ceiling Systems:
 - a. Splicing Carrying Channels and Furring Members: Use double loops of minimum **0.0625-inch- (1.59-mm-)** diameter wire.
 - b. Saddle Tying Main Runners and Cross Furring: Use minimum **0.0625-inch- (1.59-mm-)** diameter wire, or double strand of **0.0475-inch- (1.21-mm-)** diameter wire.
- D. Post-Installed Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, as appropriate for the substrate.
 1. Securing Hangers:
 - a. Acceptance Criteria: ICC-ES [**AC01**][**AC193**][**AC58**][**or**][**AC308**] .
 - b. Type: [**Torque-controlled, expansion anchor**][**torque-controlled, adhesive anchor**][**or**][**adhesive anchor**] .
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated on Drawings.
 - d. Stainless Steel Material for Exterior or Interior Locations: Alloy [**Group 1 (A1)**][**Group 2 (A4)**] stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- E. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- F. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 1. Diameter: [**0.162 inch (4.12 mm)**]**<Insert dimension>** .
- G. Flat Hangers: Steel sheet.
 1. Protective Coating: ASTM A653/A653M, [**G40 (Z120)**][**or**][**G60 (Z180)**] , hot-dip galvanized.
 2. Size and Length: [**In size indicated on Drawings**][**1 by 3/16 inch (25 by 5 mm) by length indicated on Drawings**]**<Insert dimensions>** .
- H. Isolation Strip at Exterior Walls: Provide [**one of**] the following:
 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, **1/8 inch (3.2 mm)** thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, substrates, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices required to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling track to surfaces indicated on Drawings to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than **24 inches (610 mm) o.c.**
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of nonstructural steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated on Drawings. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION OF NONSTRUCTURAL STEEL FRAMING, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
 - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
 - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF NONSTRUCTURAL STEEL FRAMING

- A. Install framing system components at spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
1. Single-Layer Application: **[As required by horizontal deflection performance requirements][16 inches (406 mm) o.c.][24 inches (610 mm) o.c.]** unless otherwise indicated on Drawings.
 2. Multilayer Application: **[As required by horizontal deflection performance requirements][16 inches (406 mm) o.c.][24 inches (610 mm) o.c.]** unless otherwise indicated on Drawings.
 3. Tile Backing Panels: **[As required by horizontal deflection performance requirements][16 inches (406 mm) o.c.]** unless otherwise indicated on Drawings.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install track at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated on Drawings to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated on Drawings.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum **1/2-inch (13-mm)** clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure unless otherwise indicated on Drawings.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated on Drawings. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated on Drawings and support closures to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated on Drawings.
 5. STC-Rated Partitions: Install framing to comply with STC-rated assembly indicated on Drawings.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of at least two studs at ends of arcs, place studs **6 inches (152 mm) o.c.**
- E. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or

powder-driven fasteners spaced **24 inches (610 mm)** o.c.

- F. Adjustable Wall-Furring Brackets: Install brackets with serrated edges facing upward spaced at minimum **48 inches (1219 mm)** o.c. vertically with **6 inches (152 mm)** maximum from floor and ceiling, and minimum **36 inches (914 mm)** o.c. horizontally with **4 inches (102 mm)** maximum from abutting construction, unless otherwise indicated on Drawings.
- G. Z-Shaped Furring:
 - 1. Install insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced [**24 inches (610 mm)**]**<Insert dimension>** o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced **24 inches (610 mm)** o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than **12 inches (305 mm)** from corner and cut insulation to fit.
- H. Suspended Assemblies: Isolate suspension assemblies from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
 - 1. Hangers: Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system spaced [**as indicated on Drawings**]**<Insert requirements>** .
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - b. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - 1) Size supplemental suspension members and hangers to support ceiling loads within [**performance limits established by referenced installation standards**]**<Insert deflection limit>** .
 - c. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - d. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - e. Do not attach hangers to steel roof deck.
 - f. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - g. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - h. Do not connect or suspend framing from ducts, pipes, or conduit.
 - 2. U-Channels: Carrying channels (main runners) spaced [**as indicated on Drawings**]**<Insert requirements>** .
 - 3. Furring Channels (Furring Members): [**As indicated on Drawings**][**U-channels**][**Studs and track**][**High-strength steel studs and track**][**Rigid hat-shaped furring channels**][**Resilient furring channels**]**<Insert requirements>** .



- a. Spacing: **[As indicated on Drawings]<Insert requirements>** .
- b. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- 4. Seismic Bracing: Sway-brace suspension systems **[with hangers used for support]<Insert requirements>** .

I. Installation Tolerances for Nonstructural Steel Framing:

- 1. Framing Members: Install each framing member so fastening surfaces vary not more than **1/8 inch (3.2 mm)** from the plane formed by faces of adjacent framing.
- 2. Suspended Assemblies: Install suspension systems that are level to within **[1/8 inch in 12 ft. (3.2 mm in 3.7 m)]<Insert dimensions>** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLATION OF GRID SUSPENSION SYSTEMS

- A. Grid Suspension Systems: Install in accordance with manufacturer's written instructions. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- B. Installation Tolerances for Grid Suspension Systems: Install suspension systems that are level to within **[1/8 inch in 12 ft. (3.2 mm in 3.7 m)]<Insert dimensions>** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16 00



Task	Specification	Specification Description
09 22 16 13	09 22 16 00	Non-Structural Metal Framing
09 22 36 13	09 23 00 00	Gypsum Plastering
09 22 36 13	09 22 13 13	Gypsum Veneer Plastering
09 22 36 23	09 23 00 00	Gypsum Plastering
09 22 36 23	09 22 13 13	Gypsum Veneer Plastering
09 22 36 33	09 23 00 00	Gypsum Plastering
09 22 36 33	09 22 13 13	Gypsum Veneer Plastering



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SECTION 09 23 00 00 - GYPSUM PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Expanded metal lath.
2. Accessories.
3. Base-coat gypsum plaster materials.
4. Finish-coat gypsum plaster materials.

B. Related Requirements:

1. Section 092613 "Gypsum Veneer Plastering" for gypsum-based veneer plaster applied on gypsum base for veneer plaster, unit masonry, and monolithic concrete.

1.2 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

- ##### B. Shop Drawings: Locations and installation of control and expansion joints, including plans, elevations, sections, and attachment details.

C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.

1.4 MOCKUPS

- ##### A. Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for each substrate and finish texture indicated for gypsum plastering, including accessories.

a. Size: **[100 sq. ft. (9 sq. m)]<Insert dimension>** in surface area.

2. Simulate finished lighting conditions for review of mockups.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Comply with ASTM C842 requirements or gypsum plaster manufacturer's written instructions, whichever are more stringent.
- B. Room Temperatures: Maintain temperatures at not less than **55 deg F (13 deg C)** or greater than **80 deg F (27 deg C)** for at least seven days before application of gypsum plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.
- C. Avoid conditions that result in gypsum plaster drying out too quickly.
 1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain base- and finish-coat plasters from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated on Drawings, provide gypsum plaster assemblies identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by a qualified testing agency.
- B. Sound-Transmission Characteristics: Where indicated on Drawings, provide gypsum plaster assemblies identical to those of assemblies tested for STC ratings in accordance with ASTM E90 and classified in accordance with ASTM E413 by a qualified testing agency.

2.3 EXPANDED METAL LATH

- A. Expanded Metal Lath: ASTM C847; cold-rolled carbon-steel sheet, hot-dip galvanized with ASTM A653/A653M **G60 (Z180)** zinc coating.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**
3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
4. Flat Diamond-Mesh Lath: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**, unbacked.
5. Self-Furring Diamond-Mesh Lath: **[V-grooved][Dimpled]**.
 - a. Weight: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**.
 - b. Paper Backing: Kraft paper factory bonded to back of lath.
6. 3/8-Inch (10-mm) Rib Lath: **[3.4 lb/sq. yd. (1.8 kg/sq. m)][4 lb/sq. yd. (2.2 kg/sq. m)]**.
 - a. Paper Backing: Kraft paper factory bonded to back of lath.

2.4 ACCESSORIES

- A. General: Comply with requirements in ASTM C841, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**
3. Cornerite: Fabricated from expanded metal lath, hot-dip galvanized with ASTM A653/A653M **G60 (Z180)** zinc coating.
 4. Striplath: Fabricated from expanded metal lath, hot-dip galvanized with ASTM A653/A653M **G60 (Z180)** zinc coating.
 5. Cornerbeads: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**.
 - a. Smallnose cornerbead with expanded flanges; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
 - b. Smallnose cornerbead with perforated flanges; use **[on curved corners][at locations indicated on Drawings]<Insert requirements>**.
 - c. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use **[on columns and for finishing unit masonry corners][at locations indicated on Drawings]<Insert requirements>**.
 - d. Bullnose cornerbead, radius **3/4-inch (19-mm)** minimum, with expanded flanges; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
 6. Casing Beads: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; square-edged style; with expanded flanges.
 7. Control Joints: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on exposed face of control joint.
 8. One-Piece Expansion Joints: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 9. Two-Piece Expansion Joints: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; formed to produce slip-joint and square-edged reveal that is adjustable from **1/4 to 5/8 inch (6 to 16 mm)** wide; with perforated flanges.
- C. Plastic Accessories: Manufactured from high-impact PVC.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[ClarkDietrich]**
 - c. **[Plastic Components, Inc]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AMICO, a Gibraltar Industries company]**

- b. [ClarkDietrich]
 - c. [Plastic Components, Inc]
 - d. <Insert manufacturer's name>
 3. Cornerbeads: With perforated flanges.
 - a. Smallnose cornerbead; use [unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>.
 - b. Bullnose cornerbead, radius **3/4-inch (19-mm)** minimum; use [unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>.
 4. Casing Beads: Square-edge style, with perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
 5. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on exposed face of control joint.
 6. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged [**1/2-inch- (13-mm-)**][**1-inch- (25-mm-)**][**1-1/2-inch- (38-mm-)**]**<Insert dimension>** wide reveal; with perforated concealed flanges.
 7. Termination Reveal Trim: F-shaped, one-piece trim, formed to produce a [**1/2-inch- (13-mm-)**][**3/4-inch- (19-mm-)**][**1-inch- (25-mm-)**]**<Insert dimension>** wide reveal at the termination of plaster where it abuts other materials; with single, perforated concealed flange.
- D. Aluminum Trim: Extruded accessories of profiles and dimensions indicated on Drawings.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Brand X Metals, Inc]
 - b. [Flannery, Inc.]
 - c. [Fry Reglet Corporation]
 - d. [Gordon Inc.]
 - e. [Pittcon Industries]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Brand X Metals, Inc]
 - b. [Flannery, Inc.]
 - c. [Fry Reglet Corporation]
 - d. [Gordon Inc.]
 - e. [Pittcon Industries]
 - f. <Insert manufacturer's name>
 3. Aluminum: Alloy and temper with not less than the strength and durability properties of **ASTM B221 (ASTM B221M)**, Alloy 6063-T5.
 4. Finish: [Mill][Chemical-conversion coating, ASTM D1730, Type B, compatible with field-applied finish coatings specified]**<Insert requirements>**.

2.5 BASE-COAT GYPSUM PLASTER MATERIALS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not

less than **<Insert value>** percent.

- B. Lightweight-Gypsum Ready-Mixed Plaster: ASTM C28/C28M, with factory-mixed perlite aggregate.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
- C. Gypsum Neat Plaster: ASTM C28/C28M, for use with job-mixed aggregates.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
- D. Gypsum Wood-Fibered Plaster: ASTM C28/C28M, for use as is or with the addition of job-mixed sand in up to equal proportions by weight.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
- E. High-Strength Gypsum Neat Plaster: ASTM C28/C28M, with a minimum, average, dry compressive strength of **2800 psi (19 MPa)** in accordance with ASTM C472 for a mix of **100 lb (45 kg)** of plaster and **2 cu. ft. (0.06 cu. m)** of sand.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
- F. Aggregates for Base-Coat Plasters: ASTM C35, **[sand][and][perlite]**.

2.6 FINISH-COAT GYPSUM PLASTER MATERIALS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- B. Gypsum Gauging Plaster: ASTM C28/C28M.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
- C. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, factory-mixed, gaged, interior finish.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
- D. High-Strength Gypsum Gauging Plaster: ASTM C28/C28M, with a minimum, average, dry compressive strength of **5000 psi (34 MPa)** in accordance with ASTM C472 for a neat mix.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
- E. Gypsum Keene's Cement: ASTM C61/C61M.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
- F. Lime: ASTM C206, **[Type S, special][or][Type N, normal]** finishing hydrated lime.
- G. Aggregates for Float Finishes: ASTM C35, **[sand][and][perlite for finish coats over base coats containing perlite]**; graded in accordance with ASTM C842.

2.7 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Compound: ASTM C631; recommended by plaster manufacturer for application indicated.
- C. Fasteners for Attaching Metal Lath to Substrates: ASTM C841.
- D. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than **0.0475-inch (1.21-mm)** diameter unless otherwise indicated.
- E. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of rated assembly.
 - 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- F. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- G. Mix Additives: Use gypsum plaster accelerator and retarder products of plaster manufacturer if required by Project conditions. Use only additives that plaster manufacturer recommends in writing for use with plaster to which it is added.

2.8 PLASTER MIXES

- A. Mixing: Comply with ASTM C842 and manufacturer's written instructions for applications indicated.
- B. Mix Additives: Use accelerators and retarders, if required by Project conditions, in accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Reject plaster materials that are wet or moisture damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components in accordance with requirements for design designations from listing organization and publication indicated on Drawings.
- B. STC-Rated Assemblies: Install components in accordance with requirements for design designations from listing organization and publication indicated on Drawings.
- C. Sound-Attenuation Blankets: Where **[indicated on Drawings][and][required by design designations from listing organization and publication indicated on Drawings]**, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- D. Acoustical Sealant: Where **[indicated on Drawings][and][required by design designations from listing organization and publication indicated on Drawings]**, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLATION OF EXPANDED METAL LATH

- A. Expanded Metal Lath: Install in accordance with ASTM C841.
 - 1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install **[flat diamond-mesh][3/8-inch (10-mm) rib]** lath.
 - 3. Curved-Ceiling Framing: Install flat diamond-mesh lath.
 - 4. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.
 - 5. Channel-Stud Solid-Plaster Partitions: Where supported by channel studs and L-runners, install flat diamond-mesh lath.
 - 6. Studless Solid-Plaster Partitions: Where supported by L-runners, install **3/8-inch (10-mm) rib** lath.

3.5 INSTALLATION OF ACCESSORIES

- A. General: Install in accordance with ASTM C841.
- B. Cornerbeads: Install at external corners.
- C. Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.
- D. Control Joints: Locate as approved by Architect for visual effect and as follows:
 - 1. With spacing between joints in either direction not exceeding the following:
 - a. Partitions: **30 ft. (9 m)**.
 - b. Ceilings: **[50 ft. (15 m)][30 ft. (9 m)]**.
 - 2. Where furred or suspended ceilings abut columns, walls, beams, or other vertical elements.
 - 3. Where ceiling framing or furring changes direction.
 - 4. Where control joints occur in supporting construction.
- E. Expansion Joints: Locate where an expansion joint occurs in supporting construction.
- F. Aluminum Trim: Install in accordance with manufacturer's written instructions.

3.6 APPLICATION OF PLASTER

- A. General: Comply with ASTM C842.
 - 1. Do not deviate more than plus or minus **1/8 inch in 10 ft. (3 mm in 3 m)** from a true plane in finished plaster surfaces when measured by a **10-ft. (3-m)** straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on **[unit masonry][and][monolithic concrete]** substrates for direct application of plaster.

3.7 INSTALLATION OF BASE-COAT GYPSUM PLASTER MATERIALS

- A. Over Expanded Metal Lath:
 - 1. Scratch Coat: **[Gypsum neat plaster with job-mixed sand][Gypsum wood-fibered plaster; neat or with job-mixed sand][High-strength gypsum neat plaster with job-mixed sand]<Insert requirements>**.
 - 2. Brown Coat: **[Lightweight-gypsum ready-mixed plaster][Gypsum neat plaster with job-mixed sand][Gypsum neat plaster with job-mixed perlite][Gypsum wood-fibered plaster with job-mixed sand][High-strength gypsum neat plaster with job-mixed sand]<Insert requirements>**.
- B. Over Unit Masonry: **[Lightweight-gypsum ready-mixed plaster][Wood-fibered gypsum plaster with job-mixed sand][Gypsum neat plaster with job-mixed sand]<Insert requirements>**.
- C. Over Monolithic Concrete: **[Gypsum neat plaster with job-mixed sand]<Insert requirements>**.

3.8 INSTALLATION OF FINISH-COAT GYPSUM PLASTER MATERIALS

- A. Smooth-Troweled Finishes:
 - 1. Materials: **[Gypsum gauging plaster and lime putty][Gypsum ready-mixed finish plaster][High-strength gypsum gauging plaster and lime putty][Gypsum Keene's cement and lime putty]<Insert requirements>**.
 - 2. Locations: Provide smooth-troweled finish **[unless otherwise indicated][where indicated on Drawings]<Insert locations>**.
- B. Float Finishes:
 - 1. Materials: **[Gypsum gauging plaster and lime putty][Gypsum Keene's cement and lime putty]<Insert requirements>**.
 - 2. Locations: Provide float finish **[unless otherwise indicated][where indicated on Drawings]<Insert locations>**.
- C. Sprayed Finishes: **[Match Architect's sample]<Insert requirements>**.
 - 1. Materials: **[Gypsum ready-mixed finish plaster]<Insert requirements>**.
 - 2. Locations: Provide sprayed finish **[unless otherwise indicated][where indicated on**

Drawings]<Insert locations>.

D. Textured Finishes: **[Match Architect's sample]<Insert requirements>.**

1. Materials: **[Gypsum ready-mixed finish plaster]<Insert requirements>.**
2. Locations: Provide textured finish **[unless otherwise indicated][where indicated on Drawings]<Insert locations>.**

E. Concealed Plaster:

1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
3. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.9 REPAIR

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.10 CLEANING

- A. Remove temporary protection and enclosure of other work after plastering is complete.
- B. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered.
- C. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 23 00 00



Task	Specification	Specification Description
09 23 13 00	09 23 00 00	Gypsum Plastering
09 23 13 00	09 22 13 13	Gypsum Veneer Plastering



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SECTION 09 24 00 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal lath.
 - 2. Accessories.
 - 3. Base-coat cement plaster.
 - 4. Cement plaster finish coats.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. For each type of product.
- B. Shop Drawings: Locations and installation of control and expansion joints, including plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For each type of factory-prepared finish coat and for each color and finish texture specified.
- D. Samples for Verification: For each type of factory-prepared finish coat and for each color and finish texture specified, **12 by 12 inches (305 by 305 mm)**, and prepared on rigid backing.
- E. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.

1.4 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for each substrate and color and finish texture indicated for cement plastering, including accessories.
 - a. Size: **[100 sq. ft. (9 sq. m)]<Insert dimension>** in surface area.

2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Comply with ASTM C926 requirements.
- B. Exterior Plasterwork:
 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 2. Apply plaster when ambient temperature is greater than **40 deg F (4.4 deg C)**.
 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Interior Plasterwork: Maintain room temperatures at greater than **40 deg F (4.4 deg C)** for at least 48 hours before plaster application, and continuously during and after application.
 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.
- D. Factory-Prepared Finish Coats: Comply with manufacturer's written instructions for environmental conditions for applying finish coats.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated on Drawings, provide cement plaster assemblies identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by a qualified testing agency.

2.2 METAL LATH

- A. Expanded Metal Lath: ASTM C847; cold-rolled carbon steel sheet, hot-dip galvanized with ASTM A653/A653M [**G60 (Z180)**][**G90 (Z275)**] zinc coating.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[CEMCO; California Expanded Metal Products Co.]**
 - c. **[ClarkDietrich]**
 - d. **[MarinoWARE]**
 - e. **[Phillips Manufacturing Co]**
 - f. **<Insert manufacturer's name>**

3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
4. Flat Diamond-Mesh Lath: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**.
 - a. Water-Resistive Barrier: Vapor-permeable paper, factory bonded to back of lath; complying with requirements in FS UU-B-790a for Type I, Grade D and with **[10-minute][60-minute]** water resistance.
 - 1) Provide water-resistive barrier **[at exterior locations][where indicated on Drawings]<Insert requirements>**.

5. Self-Furring Diamond-Mesh Lath: **[V-grooved][Dimpled]**.
 - a. Weight: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**.
 - b. Water-Resistive Barrier: Vapor-permeable paper, factory bonded to back of lath; complying with requirements in FS UU-B-790a for Type I, Grade D and with **[10-minute][60-minute]** water resistance.
 - 1) Provide water-resistive barrier **[at exterior locations][where indicated on Drawings]<Insert requirements>**.
 - c. Kraft-Paper Backing: Factory bonded to back of lath.
 - 1) Provide kraft-paper backing **[at interior locations][where indicated on Drawings]<Insert requirements>**.

6. 3/8-Inch (10-mm) Rib Lath: **[3.4 lb/sq. yd. (1.8 kg/sq. m)][4 lb/sq. yd. (2.2 kg/sq. m)]**.
 - a. Kraft-Paper Backing: Factory bonded to back of lath.

- B. Wire-Fabric Lath:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ClarkDietrich]
 - b. [Davis Wire; a Heico Wire Group company]
 - c. [K-Lath; a Tree Island Steel Ltd. company]
 - d. [Structa Wire Corp.]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ClarkDietrich]
 - b. [Davis Wire; a Heico Wire Group company]
 - c. [K-Lath; a Tree Island Steel Ltd. company]
 - d. [Structa Wire Corp.]
 - e. <Insert manufacturer's name>
3. Welded-Wire Lath: ASTM C933; self-furring, [1.14 lb/sq. yd. (0.6 kg/sq. m)][1.95 lb/sq. yd. (1.1 kg/sq. m)].
4. Woven-Wire Lath: ASTM C1032; self-furring, with stiffener wires, 1.4 lb/sq. yd. (0.8 kg/sq. m), with 1.5-inch (38-mm) openings, and woven from 0.051-inch (1.30-mm) diameter wire.
5. Water-Resistive Barrier: Vapor-permeable paper, factory bonded to back of lath; complying with requirements in FS UU-B-790a for Type I, Grade D and [in double layer, each having 10-minute][with 10-minute][with 60-minute] water resistance.
 - a. Provide water-resistive barrier [at exterior locations][where indicated on Drawings]<Insert requirements>.

2.3 ACCESSORIES

- A. General: Comply with requirements in ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [AMICO, a Gibraltar Industries company]
 - b. [Brand X Metals, Inc]
 - c. [CEMCO; California Expanded Metal Products Co.]
 - d. [ClarkDietrich]
 - e. [Flannery, Inc.]
 - f. [MarinoWARE]
 - g. [Phillips Manufacturing Co]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. **[AMICO, a Gibraltar Industries company]**
 - b. **[Brand X Metals, Inc]**
 - c. **[CEMCO; California Expanded Metal Products Co.]**
 - d. **[ClarkDietrich]**
 - e. **[Flannery, Inc.]**
 - f. **[MarinoWARE]**
 - g. **[Phillips Manufacturing Co]**
 - h. **<Insert manufacturer's name>**
3. Foundation Weep Screed: Fabricated from hot-dip-galvanized steel sheet with ASTM A653/A653M **[G60 (Z180)][G90 (Z275)]** zinc coating.
 4. Cornerite: Fabricated from metal lath, hot-dip galvanized with ASTM A653/A653M **[G60 (Z180)][G90 (Z275)]** zinc coating.
 5. External- (Outside-) Corner Reinforcement: Fabricated from metal lath, hot-dip galvanized with ASTM A653/A653M **[G60 (Z180)][G90 (Z275)]** zinc coating.
 6. Cornerbeads: Fabricated from **[zinc][zinc-coated (galvanized) steel][or][anodized aluminum]**.
 - a. Smallnose cornerbead with expanded flanges; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
 - b. Smallnose cornerbead with perforated flanges; use **[on curved corners][at locations indicated on Drawings]<Insert requirements>**.
 - c. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use **[on columns and for finishing unit masonry corners][at locations indicated on Drawings]<Insert requirements>**.
 - d. Bullnose cornerbead, radius **3/4-inch (19-mm)** minimum, with expanded flanges; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
 7. Casing Beads: Fabricated from **[zinc][zinc-coated (galvanized) steel][or][anodized aluminum]**; square-edged style; with expanded flanges.
 8. Control Joints: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on exposed face of control joint.
 9. One-Piece Expansion Joints: Fabricated from **[zinc][or][zinc-coated (galvanized) steel]**; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 10. Two-Piece Expansion Joints: Fabricated from **[zinc][zinc-coated (galvanized) steel][or][anodized aluminum]**; formed to produce slip-joint and square-edged reveal that is adjustable from **1/4 to 5/8 inch (6 to 16 mm)** wide; with perforated flanges.
- C. Plastic Accessories: Manufactured from high-impact PVC.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMICO, a Gibraltar Industries company]**
 - b. **[ClarkDietrich]**
 - c. **[Plastic Components, Inc]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[AMICO, a Gibraltar Industries company]**
 - b. **[ClarkDietrich]**
 - c. **[Plastic Components, Inc]**
 - d. **<Insert manufacturer's name>**
- 3. Cornerbeads: With perforated flanges.
 - a. Smallnose cornerbead; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
 - b. Bullnose cornerbead, radius **3/4-inch (19-mm)** minimum; use **[unless otherwise indicated][at locations indicated on Drawings]<Insert requirements>**.
- 4. Casing Beads: Square-edge style, with perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
- 5. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on exposed face of control joint.
- 6. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged **[1/2-inch- (13-mm-)][1-inch- (25-mm-)][1-1/2-inch- (38-mm-)]<Insert dimension>** wide reveal; with perforated concealed flanges.

2.4 BASE-COAT CEMENT PLASTER

- A. General: Comply with requirements in ASTM C926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed **1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m)** of cementitious materials.
 - 2. Aggregate:
 - a. Sand: Use **[unless otherwise indicated]<Insert requirements>**.
 - b. Perlite: Use **[where required by fire-resistance-rated design designations from listing organization and publication indicated on Drawings]<Insert requirements>**.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 - 1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and **[0 to 3/4][3/4 to 1-1/2]** parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and **[0 to 3/4][3/4 to 1-1/2]** parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
 - 2. Masonry Cement Mixes:
 - a. Scratch Coat: Mix 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: Mix 1 part masonry cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.
 - 3. Portland and Masonry Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.

- b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
 4. Plastic Cement Mixes:
 - a. Scratch Coat: Mix 1 part plastic cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: Mix 1 part plastic cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.
 5. Portland and Plastic Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Base-Coat Mix for Use over Solid Plaster Bases: Single base (scratch) coat for two-coat plasterwork as follows:
 1. Low-Absorption Unit Masonry and Concrete Substrates:
 - a. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - c. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
 2. High-Absorption Unit Masonry and Concrete Substrates:
 - a. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - c. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - d. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.

2.5 CEMENT PLASTER FINISH COATS

- A. Job-Mixed Finish-Coat Mix: Comply with requirements in ASTM C926.
 1. Aggregates:
 - a. Sand: Use over base coats containing sand.
 - b. Perlite: Use over base coats containing perlite.
 - c. Exposed Aggregates: Use **[where indicated on Drawings]<Insert requirements>**.
 2. Portland Cement Mix: For cementitious material, mix 1 part portland cement and **[3/4 to 1-1/2][1-1/2 to 2]** parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
 3. Masonry Cement Mix: Use 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 4. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

5. Plastic Cement Mix: Use 1 part plastic cement and 1-1/2 to 3 parts aggregate.
- B. Ready-Mixed Finish-Coat Plaster: Factory-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[California Stucco Products Corp.]**
 - b. **[El Rey Stucco Solutions; a Parex USA, Inc. brand]**
 - c. **[Florida Stucco]**
 - d. **[Omega Products International, Inc.]**
 - e. **[Parex, a Sika brand]**
 - f. **[Quikrete; The QUIKRETE Companies, LLC]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[California Stucco Products Corp.]**
 - b. **[El Rey Stucco Solutions; a Parex USA, Inc. brand]**
 - c. **[Florida Stucco]**
 - d. **[Omega Products International, Inc.]**
 - e. **[Parex, a Sika brand]**
 - f. **[Quikrete; The QUIKRETE Companies, LLC]**
 - g. **<Insert manufacturer's name>**
 3. Color: **[Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 4. Source Limitations: Obtain ready-mixed finish-coat plaster from single source from single manufacturer.
- C. Acrylic-Based Finish Coatings: Factory-mixed, acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[California Stucco Products Corp.]**
 - b. **[Dryvit Systems, Inc.]**
 - c. **[El Rey Stucco Solutions; a Parex USA, Inc. brand]**
 - d. **[Finestone, a Sika brand]**
 - e. **[Master Wall Inc.]**
 - f. **[Omega Products International, Inc.]**
 - g. **[Senergy; a SIKA brand]**
 - h. **[Sto Corp.]**
 - i. **[Stuc-O-Flex International, Inc.]**
 - j. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[California Stucco Products Corp.]**
 - b. **[Dryvit Systems, Inc.]**
 - c. **[El Rey Stucco Solutions; a Parex USA, Inc. brand]**
 - d. **[Finestone, a Sika brand]**
 - e. **[Master Wall Inc.]**
 - f. **[Omega Products International, Inc.]**
 - g. **[Senergy; a SIKA brand]**
 - h. **[Sto Corp.]**
 - i. **[Stuc-O-Flex International, Inc.]**
 - j. **<Insert manufacturer's name>**
3. Color: **[Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
4. Texture: **[Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert texture>**.
5. Source Limitations: Obtain acrylic-based finish coating from single source from single manufacturer.

2.6 PLASTER MATERIALS

- A. Portland Cement: ASTM C150/C150M, **[Type I][Type II]**.
 1. Color for Finish Coats: **[White][Gray]**.
- B. Masonry Cement: ASTM C91/C91M, Type N.
 1. Color for Finish Coats: **[White][Gray]**.
- C. Plastic Cement: ASTM C1328/C1328M.
- D. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color **[to match Architect's sample]<Insert requirements>**.
- E. Lime: ASTM C206, Type S; or ASTM C207, Type S.
- F. Sand Aggregate: ASTM C897.
 1. Color for Job-Mixed Finish Coats: **[White][In color matching Architect's sample]**.
- G. Perlite Aggregate: ASTM C35.
- H. Exposed Aggregates for Finish Coats: **[For marblecrete finish, clean, sound, crushed marble matching color and size gradation of Architect's sample]<Insert requirements>**.

2.7 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C932.
- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.
- E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than **0.0475-inch (1.21-mm)** diameter unless otherwise indicated.
- F. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- G. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Reject plaster materials that are wet or moisture damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster in accordance with ASTM C926.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components in accordance with requirements for design designations from listing organization and publication indicated on Drawings.
- B. Sound-Attenuation Blankets: Where indicated on Drawings, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- C. Acoustical Sealant: Where indicated on Drawings, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLATION OF METAL LATH

- A. Metal Lath: Install in accordance with ASTM C1063.
 - 1. Partition Framing and Vertical Furring: Install **[flat diamond-mesh][welded-wire][woven-wire]** lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install **[flat diamond-mesh][3/8-inch (10-mm) rib][welded-wire][woven-wire]** lath.
 - 3. Curved-Ceiling Framing: Install **[flat diamond-mesh][welded-wire][woven-wire]** lath.
 - 4. On Solid Surfaces, Not Otherwise Furred: Install **[self-furring diamond-mesh][welded-wire][woven-wire]** lath.

3.5 INSTALLATION OF ACCESSORIES

- A. Install in accordance with ASTM C1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install **[lath-type, external-corner reinforcement][cornerbead]** at exterior locations.
 - 2. Install cornerbead at interior locations.
- C. Control Joints: Locate as approved by Architect for visual effect and as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: **144 sq. ft. (13.4 sq. m).**
 - b. Horizontal and Other Nonvertical Surfaces: **100 sq. ft. (9.3 sq. m).**
 - 2. At distances between control joints of not greater than **18 ft. (5.5 m)** o.c.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4. Where control joints occur in surface of construction directly behind plaster.
 - 5. Where plastered ceiling framing or furring changes direction.
 - 6. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
- D. Expansion Joints: Locate where expansion joints occur in supporting construction.

3.6 APPLICATION OF BASE-COAT CEMENT PLASTER

- A. General: Comply with ASTM C926.
 - 1. Install so that finished plaster surfaces will not deviate more than plus or minus **1/4 inch in 10 ft. (6 mm in 3 m)** from a true plane when measured by a **10-ft. (3-m)** straightedge placed on surface.
 - 2. Install so finished plaster surfaces will be flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets.
- B. Bonding Compound: Apply on **[unit masonry][and][concrete]** substrates for direct application of plaster.
- C. Wall/Vertical Base Coats:

1. Three-Coat Plasterwork Over Metal Lath: Install base-coat mixes for use over metal lath to produce scratch and brown coats having **3/4-inch (19-mm)** total thickness.
2. Two-Coat Plasterwork Over Solid Plaster Bases: Install base-coat mix for use over solid plaster bases in **3/8-inch (10-mm) thickness on masonry****[1/4-inch (6-mm) thickness on concrete]**.

D. Ceiling/Horizontal Base Coats:

1. Three-Coat Plasterwork Over Metal Lath: Install base-coat mixes for use over metal lath to produce scratch and brown coats with **[1/2-inch (13-mm) total thickness]****[3/4-inch (19-mm) total thickness for metal lath on concrete]**.
2. Two-Coat Plasterwork Over Solid Plaster Bases: Install base-coat mix for use over solid plaster bases in **1/4-inch (6-mm)** thickness on concrete.

3.7 APPLICATION OF CEMENT PLASTER FINISH COATS

A. General: Comply with ASTM C926.

1. Do not deviate more than plus or minus **1/4 inch in 10 ft. (6 mm in 3 m)** from a true plane in finished plaster surfaces when measured by a **10-ft. (3-m)** straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Plaster Finish Coats: Apply to provide **[float][dash][scraped trowel-textured][skip trowel-textured][brocade (knock-down dash)][trowel sweep][combed][sacked (California mission)][English][marblecrete]<Insert requirements>** finish to match Architect's sample.

C. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, in accordance with manufacturer's written instructions.

D. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

E. Concealed Interior Plasterwork:

1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
3. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.8 REPAIR

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.9 CLEANING

A. Remove temporary protection and enclosure of other work after plastering is complete.



- B. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered.
- C. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00 00



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Task	Specification	Specification Description
09 24 13 00	09 23 00 00	Gypsum Plastering
09 24 13 00	09 24 00 00	Cement Plastering
09 24 13 00	09 22 13 13	Gypsum Veneer Plastering
09 24 23 00	09 24 00 00	Cement Plastering
09 24 33 00	09 24 00 00	Cement Plastering
09 28 13 00	09 22 13 13	Gypsum Veneer Plastering
09 28 13 00	09 29 00 00	Gypsum Board
09 28 13 00	09 30 13 00	Ceramic Tiling



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SECTION 09 29 00 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board.
3. Tile backing panels.
4. Texture finish.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior applications.
2. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for steel shaft wall framing, gypsum shaft liners, and other components of shaft wall assemblies.
4. Section 092216 "Non-Structural Metal Framing" for nonstructural steel framing and suspension systems that support gypsum board panels.
5. Section 092613 "Gypsum Veneer Plastering" for gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
6. Section 093013 "Ceramic Tiling" for tile backing panels installed as substrates for ceramic tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Locations and installation of control and expansion joints, including plans, elevations, sections, and attachment details.

C. Samples for Initial Selection:

1. Trim Accessories: For [aluminum trim][and][base-of-wall PVC moisture-barrier trim]<Insert requirements> .
2. Texture Finish: For each type required.

D. Samples for Verification: Actual sample of finished products for the following:

1. Trim Accessories: Actual sample of finished products for each profile of [aluminum trim][and][base-of-wall PVC moisture-barrier trim]<Insert requirements> .
 - a. Size: Full size profile, [12 inches (305 mm)]<Insert dimension> long.
2. Texture Finish: [Manufacturer's standard size]<Insert requirements> for each texture finish required and on same backing indicated for Work.

E. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
3. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

1.3 MOCKUPS

- A. Build mockups of at least **[100 sq. ft. (9 sq. m)]<Insert dimension>** in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 1. Build mockups for the following:
 - a. Each level of interior gypsum board finish required for use in exposed locations.
 - b. Each texture finish required.
 2. Apply or install final decoration required, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of gypsum board and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E119; tested by a qualified testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E90 and classified in accordance with ASTM E413; tested by a qualified testing agency.
- C. Verify ceiling and wall materials comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Verify ceiling and wall materials comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

2.3 GYPSUM BOARD, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
- B. Product Data: Verify materials were manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- C. Regional Materials: Verify materials were manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
- D. Size: Provide panel products in maximum lengths and widths available that will minimize joints in each area and that correspond with support system specified or indicated on Drawings.

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
3. Thickness: [As indicated on Drawings][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)] .
4. Long Edges: [Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements> .

B. Lightweight Gypsum Wallboard: ASTM C1396/C1396M; manufactured to be lighter in weight and have greater sag resistance than traditional gypsum board of same thickness.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>

3. Thickness: **[As indicated on Drawings][1/2 inch (12.7 mm)]** .
4. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .

C. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
3. Thickness: **[As indicated on Drawings][5/8 inch (15.9 mm)][3/4 inch (19.1 mm)]** .
4. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .

D. Lightweight Gypsum Board, Type X: ASTM C1396/C1396M; manufactured to be lighter in weight than traditional Type X gypsum board of same thickness.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[USG Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[USG Corporation]**
 - f. **<Insert manufacturer's name>**
 3. Thickness: **[As indicated on Drawings][5/8 inch (15.9 mm)]** .
 4. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .
- E. Gypsum Board, Type C: ASTM C1396/C1396M; manufactured to have increased fire-resistive capability.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 3. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 5. Long Edges: Tapered.
- F. Lightweight Gypsum Board, Type C: ASTM C1396/C1396M; manufactured to have increased fire-resistive capability and to be lighter in weight than traditional gypsum board of same thickness.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**

- c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 - 3. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 - 4. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .
- G. Flexible Gypsum Board: ASTM C1396/C1396M; manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[PABCO Gypsum]**
 - c. **[Panel Rey]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **[PABCO Gypsum]**
 - c. **[Panel Rey]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
 - 3. Core: **[As indicated on Drawings][1/4 inch (6.4 mm); regular type][3/8 inch (9.5 mm); regular type][5/16 inch (7.9 mm); Type C as required by fire-resistance-rated assembly on Drawings; with ASTM D3273 mold-resistance score of 10 rated in accordance with ASTM D3274]<Insert requirements>** .
 - 4. Long Edges: Tapered.
- H. Gypsum Ceiling Board: ASTM C1396/C1396M.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**

- d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 3. Thickness: **[As indicated on Drawings][1/2 inch (12.7 mm)]** .
 4. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .
- I. Foil-Backed Gypsum Board: ASTM C1396/C1396M.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - b. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]<Insert requirements>** .
 4. Long Edges: **[Tapered]<Insert requirements>** .
 - J. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M, tested in accordance with ASTM C1629/C1629M.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**

- d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][5/8 inch (15.9 mm), Type X]<Insert requirements>** .
 4. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 5. Indentation: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 6. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 7. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 8. Long Edges: **[Tapered]<Insert requirements>** .
- K. Impact-Resistant Gypsum Board: ASTM C1396/C1396M or ASTM C1658/C1658M, tested in accordance with ASTM C1629/C1629M.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][5/8 inch (15.9 mm), Type X]<Insert requirements>** .
 4. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]**

- requirements.
 5. Indentation: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements.
 6. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements.
 7. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements in accordance with test in Annex A1.
 8. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 9. Long Edges: [Tapered]<Insert requirements> .
- L. Mold-Resistant Gypsum Board: ASTM C1396/C1396M; manufactured with moisture- and mold-resistant core and paper surfaces.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), Type C as required by fire-resistance-rated assembly indicated on Drawings]<Insert requirements> .
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 5. Long Edges: [Square][Tapered]<Insert requirements> .
- M. Lightweight Mold-Resistant Gypsum Board: ASTM C1396/C1396M; manufactured with moisture- and mold-resistant core and paper surfaces.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [USG Corporation]
 - b. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[USG Corporation]**
 - b. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]<Insert requirements>** .
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 5. Long Edges: **[Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>** .
- N. Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M; manufactured with fiberglass mat laminated to both sides and designed for interior use.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C as required by fire-resistance-rated assembly indicated on Drawings][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), Type C as required by fire-resistance-rated assembly indicated on Drawings]<Insert requirements>** .
 4. Abuse and Impact Resistance:
 - a. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 - b. Indentation: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 - c. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements.
 - d. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds **[Level 1][Level 2][Level 3]** requirements in accordance with test in Annex A1.

5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 6. Long Edges: Tapered.
- O. Acoustically Enhanced Gypsum Board: ASTM C1766; multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - c. **[PABCO Gypsum]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - c. **[PABCO Gypsum]**
 - d. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]<Insert requirements>** .
 4. Long Edges: Tapered.
- P. Trim for Interior Gypsum Board: ASTM C1047.
1. Material: **[Galvanized-steel sheet or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet][Galvanized-steel sheet or aluminum-coated steel sheet or rolled zinc][Plastic][Paper-faced galvanized-steel sheet][PVC]<Insert material>** .
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.
 - g. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- Q. Base-of-Wall PVC Moisture-Barrier Trim: Proprietary extruded shapes that lifts finish panels above the floor surface to prevent moisture damage.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Waterguard]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Waterguard]**
 - b. **<Insert manufacturer's name>**
 3. Height: **[1/2 inch (12.7 mm)][1-3/4 inches (44 mm)][3-1/2 inches (89 mm)]** .
 4. Fire-Resistance-Rated Assemblies: Comply with requirements of assembly indicated on Drawings.
- R. Aluminum Trim: Extruded accessories of profiles and dimensions indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Brand X Metals, Inc]**
 - b. **[Flannery, Inc.]**
 - c. **[Fry Reglet Corporation]**
 - d. **[Gordon Inc.]**
 - e. **[Pittcon Industries]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Brand X Metals, Inc]**
 - b. **[Flannery, Inc.]**
 - c. **[Fry Reglet Corporation]**
 - d. **[Gordon Inc.]**
 - e. **[Pittcon Industries]**
 - f. **<Insert manufacturer's name>**
 3. Product Standard: Alloy and temper with not less than the strength and durability properties of **ASTM B221 (ASTM B221M)**, Alloy 6063-T5.
 4. Finish: **[Corrosion-resistant primer compatible with joint compound and finish materials specified]<Insert finish>** .
- S. Joint Treatment Materials for Interior Gypsum Board: Comply with ASTM C475/C475M requirements.
1. Joint Tape: Paper.
 2. Joint Compound: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - a. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant gypsum board products.
 - b. Prefilling: At open joints [, **rounded or beveled panel edges,**] and damaged surface areas, use setting-type taping compound.
 - c. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use **[setting-type taping][drying-type, all-purpose]** compound.
 - d. Fill Coat: For second coat, use **[setting-type, sandable topping][drying-type, all-purpose]** compound.
 - e. Finish Coat: For third coat, use **[setting-type, sandable topping][drying-type, all-**

- f. **purpose]** compound.
Skim Coat: For final coat of Level 5 finish, use **[setting-type, sandable topping compound][drying-type, all-purpose compound][high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish]** .

2.5 EXTERIOR GYPSUM BOARD

- A. Exterior Gypsum Soffit Board: ASTM C1396/C1396M, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **<Insert manufacturer's name>**
 - 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C as required by fire-resistance-rated assembly indicated on Drawings][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), Type C as required by fire-resistance-rated assembly indicated on Drawings]<Insert requirements>** .
- B. Trim for Exterior Gypsum Board: ASTM C1047.
 - 1. Material: **[Hot-dip galvanized-steel sheet, plastic, or rolled zinc]<Insert material>** .
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Joint Treatment Materials for Exterior Gypsum Board: Comply with ASTM C475/C475M requirements.
 - 1. Joint Tape: Paper.
 - 2. Joint Compound: Use setting-type taping compound and setting-type, sandable topping

compound.

2.6 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Gypsum Panel: ASTM C1658/C1658M, with fiberglass mat partially or completely embedded into the core.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), abuse resistant]** .
 4. Long Edges: Tapered.
 5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- B. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: ASTM C1178/C1178M, with a water-resistant coating on one surface, and manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**

- b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]** .
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

C. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[Panel Rey]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[Panel Rey]**
 - e. **<Insert manufacturer's name>**
3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]<Insert requirements>** .

D. Joint Treatment Materials for Tile Backing Panels: Comply with ASTM C475/C475M requirements.

1. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant panel products.
2. Joint Tape: As recommended in writing by panel manufacturer.
3. Joint Compound for Tile Backing Panels:
 - a. Glass-Mat, Water-Resistant Gypsum Panel: As recommended in writing by panel manufacturer.
 - b. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: As recommended in writing by panel manufacturer.
 - c. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 Gypsum Board, Type C

A. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[American Gypsum]**

2. [CertainTeed; SAINT-GOBAIN]
3. [Georgia-Pacific Gypsum LLC]
4. [Gold Bond Building Products, LLC provided by National Gypsum Company]
5. [PABCO Gypsum]
6. [Panel Rey]
7. [USG Corporation]
8. <Insert manufacturer's name>

2.8 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended in writing by manufacturer for directly adhering gypsum panels to continuous substrate.
 1. Verify adhesives have a VOC content of [50]<Insert number> g/L or less.
- C. Steel Drill Screws: ASTM C1002 unless otherwise specified or indicated on Drawings.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers as follows:
 1. Non-Fire-Resistance-Rated Assemblies: **[Glass][or][slag or rock wool]** .
 2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- E. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
 1. Product Data: Verify architectural sealant has a VOC content of 250 g/L or less.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

2.9 Paperless Wallboard

- A. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. <Insert manufacturer's name>

2.10 TEXTURE FINISH

- A. Primer: As recommended in writing by texture finish manufacturer.
- B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested in accordance with ASTM E84.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 3. Texture: **[Fine][Medium][Coarse]** .
- C. Aggregate Job-Mixed Finish: Water-based, drying-type texture finish for spray application.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 3. Texture: **[Light spatter][Spatter knock-down]<Insert texture>** .
- D. Non-Aggregate Premixed Finish: Vinyl texture finish for spray application.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[CertainTeed; SAINT-GOBAIN]**
- b. **[ProForm Finishing Products, LLC provided by National Gypsum Company]**
- c. **[USG Corporation]**
- d. **<Insert manufacturer's name>**

3. Texture: **[Orange peel][Spatter][Spatter knock-down]<Insert texture>** .

E. Acoustical Finish: Water-based, chemical-setting or drying-type, job-mixed texture finish for spray application.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[International Cellulose Corp.]**
- b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[International Cellulose Corp.]**
- b. **<Insert manufacturer's name>**

3. Application Thickness: **[1/2 inch (12.7 mm)]<Insert dimension>** .

4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- a. Flame-Spread Index: **[5]<Insert value>** or less.
- b. Smoke-Developed Index: **[5]<Insert value>** or less.

5. NRC: **[0.65]<Insert NRC>** in accordance with ASTM C423.

2.11 Tile Backing Panels: Water-Resistant Fiber-Reinforced Gypsum Backing Board

A. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **<Insert manufacturer's name>**

2.12 Glass-Mat, Water-Resistant Backing Board

A. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[CertainTeed; SAINT-GOBAIN]**
2. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
3. **[USG Corporation]**
4. **<Insert manufacturer's name>**

2.13 Gypsum Board, Type X

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[American Gypsum]**
 2. **[CertainTeed; SAINT-GOBAIN]**
 3. **[Georgia-Pacific Gypsum LLC]**
 4. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 5. **[PABCO Gypsum]**
 6. **[Panel Rey]**
 7. **[USG Corporation]**
 8. **<Insert manufacturer's name>**

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF GYPSUM BOARD, GENERAL

- A. Comply with ASTM C840 requirements.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.6 mm)** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form expansion (control) joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.7 sq. m)** in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch- (6.4-**

to 9.5-mm-) wide joints to install sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 requirements and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound-attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Single-Layer Application:

- 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated on Drawings.
- 2. On partitions/walls, apply gypsum panels [**vertically (parallel to framing)**][**horizontally (perpendicular to framing)**] unless otherwise specified or indicated on Drawings or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.
- 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

- 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, **16 inches (406 mm)** minimum, from parallel base-layer joints, unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.
- 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over studs or furring members and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated on Drawings or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers **[and face layers separately to supports with screws][with screws; fasten face layers with adhesive and supplementary fasteners]** .
- C. Application of Laminating Adhesive to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- D. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus **12-inch- (305-mm-)** long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws **16 inches (406 mm) o.c.** Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced **12 inches (305 mm) o.c.**
- E. Trim for Interior Gypsum Board: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in accordance with manufacturer's written instructions.
1. Cornerbead: Install at outside corners **[unless otherwise specified or indicated on Drawings]** .
 2. Bullnose Bead: Install **[at outside corners][where indicated on Drawings]<Insert requirements>** .
 3. LC-Bead: Install **[at exposed panel edges]<Insert requirements>** .
 4. L-Bead: Install **[where indicated on Drawings]<Insert requirements>** .
 5. U-Bead: Install **[at exposed panel edges][where indicated on Drawings]<Insert requirements>** .
 6. Curved-Edge Cornerbead: Install at curved openings.
 7. Expansion (Control) Joint: Install control joints **[at locations indicated on Drawings][in accordance with ASTM C840 and in specific locations approved by Architect for visual effect]<Insert requirements>** .
- F. Base-of-Wall PVC Moisture Barrier Trim: Install at base of wall **[unless otherwise specified or indicated on Drawings]** .
- G. Aluminum Trim: Install in locations **[indicated on Drawings]<Insert requirements>** .
- H. Joint Treatment Materials for Interior Gypsum Board: Treat joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare panel surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
1. Prefill open joints **[, rounded or beveled edges,]** and damaged surface areas.
 2. Apply joint tape over panel joints, except for trim products specifically indicated as not intended to receive tape.
- I. Finish interior gypsum board panels to comply with levels indicated below and in accordance with ASTM C840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated on Drawings.
 2. Level 2: **[Panels that are substrate for tile][Panels that are substrate for acoustical**

- tile][Where indicated on Drawings]<Insert locations> .
3. Level 3: [Where indicated on Drawings]<Insert locations> .
 - a. Primer and its application to surfaces are specified in [Section 099123 "Interior Painting."][Section 099124 "Interior Painting (MPI Standards)."]
 4. Level 4: [At panel surfaces that will be exposed to view unless otherwise indicated]<Insert locations> .
 - a. Primer and its application to surfaces are specified in [Section 099123 "Interior Painting."][Section 099124 "Interior Painting (MPI Standards)."]
 5. Level 5: [Where indicated on Drawings]<Insert locations> .
 - a. Primer and its application to surfaces are specified in [Section 099123 "Interior Painting."][Section 099124 "Interior Painting (MPI Standards)."]

3.4 INSTALLATION OF EXTERIOR GYPSUM BOARD

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 1. Install with **1/4-inch (6.4-mm)** open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.
- B. Trim for Exterior Gypsum Board: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use **[at exposed panel edges]<Insert requirements>** .
 3. Expansion (Control) Joint: Install control joints **[at locations indicated on Drawings][in accordance with ASTM C840 and in specific locations approved by Architect for visual effect]<Insert requirements>** .
- C. Finish exterior gypsum board in accordance with manufacturer's written instructions.

3.5 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Gypsum Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
- B. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: Comply with manufacturer's written installation instructions and install at **[showers, tubs, and where indicated on Drawings][locations indicated to receive tile]** . Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
- C. Water-Resistant Gypsum Backing Board: Install where indicated with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- E. Finish tile backing panels in accordance with manufacturer's written instructions.

3.6 APPLICATION OF TEXTURE FINISH

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finish. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture [**matching approved mockup and**] free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finish from contacting surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finish contacts these surfaces, immediately remove droppings and overspray to prevent damage in accordance with texture-finish manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from joint compound and promptly remove from floors and other non-gypsum board surfaces. Repair surfaces stained, marred, or otherwise damaged during gypsum board installation and finishing.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that have gotten wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00 00



Task	Specification	Specification Description
09 29 10 00	01 11 19 00	No Specification Required
09 29 10 00	09 29 00 00	Gypsum Board
09 29 82 00	09 29 00 00	Gypsum Board



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SECTION 09 30 13 00 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quarry tiles.
2. Pressed floor tiles.
3. Porcelain tiles.
4. Ceramic mosaic tiles.
5. Glazed wall tiles.
6. Thresholds.
7. Tile backing panels.
8. Waterproof membranes.
9. Crack isolation membranes.
10. Setting materials.
11. Grout materials.
12. Metal flooring transitions.
13. Metal edge trim.

B. Related Requirements:

1. **[Section 071326 "Self-Adhering Sheet Waterproofing"]**[Section 071353 "Elastomeric Sheet Waterproofing"]**[Section 071354 "Thermoplastic Sheet Waterproofing"]**[Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"]**[Section 071416 "Cold Fluid-Applied Waterproofing"]** for waterproofing under thickset mortar beds.
2. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.
3. Section 092400 "Cement Plastering" for scratch coat for thickset mortar setting-bed installations.
4. Section 092613 "Gypsum Veneer Plastering" for cementitious backer units.
5. Section 092900 "Gypsum Board" for tile backing panels.
6. Section 093023 "Glass Tiling."
7. Section 093033 "Stone Tiling."
8. Section 096340 "Stone Flooring" for stone thresholds.

1.2 DEFINITIONS

- A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Large Format Tile: Tile with at least one edge **15 inches (381 mm)** or longer.
- D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site]****[by web conference]**<Insert

location> .

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of specified product.
- B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. [**Show thresholds.**]
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.
- D. Samples for Verification:
 1. Full-size units of each type and composition of tile and for each color and finish required. [**For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.**][**For tile with aesthetic classification V3 or V4, provide 12 tiles from same production run.**]
 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least [12 inches (300 mm) square][36 inches (900 mm) square]<Insert size> , but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 3. Full-size units of each type of trim and accessory [**for each color and finish required**] .
 4. Stone thresholds in 6-inch (152-mm) lengths.
 5. Metal flooring transitions 6-inch (152-mm) lengths.
- E. Sustainable Design Submittals:
 1. Environmental Product Declaration (EPD): For each product.
 2. Health Product Declaration (HPD): For each product.
 3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 4. Environmental Product Declaration (EPD): For each product.
 5. Health Product Declaration (HPD): For each product.
 6. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 7. Environmental Product Declaration (EPD): For each product.
 8. Environmental Product Declaration (EPD): For each product.
 9. Environmental Product Declaration (EPD): For each product.
 10. Third-Party Certifications: For each product.
 11. Third-Party-Certified Life-Cycle Assessment: For each product.
 12. Product Data: For adhesives, indicating VOC content.
 13. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- B. Product Certificates: For each type of product, including product use classification.
- C. Product Test Reports:

1. Tile-setting and -grouting products.
2. Certified porcelain tile.

- D. Slip-Resistance Test Reports: For each type of floor tile, from a qualified independent testing agency.
- E. Field Quality Control Reports: Water test reports of membrane in wet areas.
- F. Qualification Statements: For Installer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to **[3][5]<Insert number>** percent of amount installed for each type, composition, color, pattern, and size specified.
 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated for Project.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Installer is **[a Five-Star member of the National Tile Contractors Association][or][a Trowel of Excellence member of the Tile Contractors' Association of America]** .
 2. Installer's supervisor for Project holds the International Masonry Institute's Supervisor Certification.
 3. Installer employs only **[Ceramic Tile Education Foundation Certified Installers][or][installers recognized by the U.S. Department of Labor as Journeyman Tile Layers]** for Project.
 4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of **[mud floors][mud walls][membranes][shower receptors][and][large format tile]** .

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of **[each type of]** floor tile installation.
 2. Build mockup of **[each type of]** wall tile installation.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.
 - 1. Warranty Period: **[Five years][10 years][25 years][Lifetime]** from date of Product Purchase.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Tile: Obtain **[tile of each type and color or finish][tile of each type][tile of each color or finish][tile]** from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[ARDEX Americas]**
 - b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**

- b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **<Insert manufacturer's name>**
- 3. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
- 4. Obtain underlayment from manufacturer of setting and grouting materials.
- 5. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
- 6. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. **Accessory Products:** Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Stone thresholds.
 - 2. Backer units.

2.2 CERAMIC TILE SYSTEM, GENERAL

- A. **ANSI Ceramic Tile Standard:** Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard Grade requirements [**unless otherwise indicated**] .
- B. **ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. **Factory Blending:** For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. **Mounting:** For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation [**in swimming pools**][**on exteriors**][**or**][**in wet areas**] , do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 QUARRY TILES

- A. **Quarry Tile :**
 - 1. **Manufacturers:** Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**] :

- a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Daltile; a brand of Dal-Tile Corporation]**
 - c. **[Elgin Butler Company]**
 - d. **[Florida Tile, Inc.]**
 - e. **[Interceramic]**
 - f. **[Metropolitan Ceramics]**
 - g. **[Quarry Tile Company.]**
 - h. **[Summitville Tiles, Inc.]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Daltile; a brand of Dal-Tile Corporation]**
 - c. **[Elgin Butler Company]**
 - d. **[Florida Tile, Inc.]**
 - e. **[Interceramic]**
 - f. **[Metropolitan Ceramics]**
 - g. **[Quarry Tile Company.]**
 - h. **[Summitville Tiles, Inc.]**
 - i. **<Insert manufacturer's name>**
3. Type: **[Unglazed][Glazed][Chemical resistant]** .
4. Face Size: **[3 by 3 inches (76 by 76 mm)][4 by 4 inches (102 by 102 mm)][6 by 3 inches (152 by 76 mm)][6 by 6 inches (152 by 152 mm)][8 by 3-7/8 inches (200 by 98 mm)][8 by 8 inches (200 by 200 mm)]<Insert dimensions>** .
5. Thickness: **[3/8 inch (9.5 mm)][1/2 inch (12.7 mm)][3/4 inch (19 mm)]** .
6. Wearing Surface: **[Nonabrasive, smooth][Abrasive aggregate embedded in surface]<Insert description>** .
7. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]** .
8. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. Chemical Reagent: **<Insert chemical reagent>** .
9. Tile Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>** .
10. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
11. Precoat with temporary protective coating.
12. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **[and matching characteristics of adjoining flat tile]** . Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved **[with surface bullnose top edge]** , face size **[6 by 6 inches (152 by 152 mm)][8 by 3-7/8 inches (200 by 98 mm)]<Insert dimensions>** .
 - b. Wainscot Cap: Surface bullnose, face size **[6 by 6 inches (152 by 152 mm)][8 by 3-7/8 inches (200 by 98 mm)]<Insert dimensions>** .
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.

2.4 PRESSED FLOOR TILES

A. Pressed Floor Tile :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Daltile; a brand of Dal-Tile Corporation]**
 - c. **[Florim USA]**
 - d. **[Interceramic]**
 - e. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - f. **[Vitromex USA, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Daltile; a brand of Dal-Tile Corporation]**
 - c. **[Florim USA]**
 - d. **[Interceramic]**
 - e. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - f. **[Vitromex USA, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Type: **[Unglazed][Glazed][Chemical resistant]** .
4. Face Size: **[3 by 3 inches (76 by 76 mm)][4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][7-3/4 by 3-7/8 inches (197 by 98 mm)][7-7/8 by 7-7/8 inches (200 by 200 mm)][11-13/16 by 11-13/16 inches (300 by 300 mm)]<Insert dimensions>** .
5. Face Size Variation: **[Calibrated or rectified][Rectified]** .
6. Thickness: **[1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]** .
7. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]** .
8. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. Chemical Reagent: **<Insert chemical reagent>** .
9. Tile Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>** .
10. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **[and matching characteristics of adjoining flat tile]** . Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved, module size **[same as adjoining flat tile]<Insert size>** .
 - b. Base Cap for Portland Cement Mortar Installations: Bead (bullnose), module size **[same as adjoining flat tile]<Insert size>** .
 - c. Base Cap for Thinset Mortar Installations: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .

- d. Wainscot Cap for Portland Cement Mortar Installations: Bead (bullnose), module size **[same as adjoining flat tile]<Insert size>** .
- e. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .
- f. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it; same size as adjoining flat tile.
- g. External Corners for Portland Cement Mortar Installations: Bead (bullnose), module size **[same as adjoining flat tile]<Insert size>** .
- h. External Corners for Thinset Mortar Installations: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .
- i. Internal Corners:
 - 1) Coved, module size **[same as adjoining flat tile]<Insert size>** .
 - 2) Field-butt square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
- j. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (102-mm) dimension.

2.5 PORCELAIN TILES

A. Porcelain Tile :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Crossville, Inc.]**
 - c. **[Daltile; a brand of Dal-Tile Corporation]**
 - d. **[Florida Tile, Inc.]**
 - e. **[Florim USA]**
 - f. **[Interceramic]**
 - g. **[Iris Ceramics U.S., a division of Stonepeak Ceramics, Inc.]**
 - h. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - i. **[Portobello America, Inc.]**
 - j. **[Vitromex USA, Inc.]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Crossville, Inc.]**
 - c. **[Daltile; a brand of Dal-Tile Corporation]**
 - d. **[Florida Tile, Inc.]**
 - e. **[Florim USA]**
 - f. **[Interceramic]**
 - g. **[Iris Ceramics U.S., a division of Stonepeak Ceramics, Inc.]**
 - h. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - i. **[Portobello America, Inc.]**

- j. **[Vitromex USA, Inc.]**
- k. **<Insert manufacturer's name>**

- 3. Type: **[Unglazed][Glazed][Chemical resistant]** .
- 4. Certification: Tile certified by the Porcelain Tile Certification Agency.
- 5. Face Size: **[3 by 3 inches (76 by 76 mm)][4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][7-3/4 by 3-7/8 inches (197 by 98 mm)][7-7/8 by 7-7/8 inches (200 by 200 mm)][11-13/16 by 11-13/16 inches (300 by 300 mm)]<Insert dimensions>** .
- 6. Face Size Variation: Rectified.
- 7. Thickness: **[1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]** .
- 8. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]** .
- 9. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.

- a. Chemical Reagent: **<Insert chemical reagent>** .

- 10. Tile Color, Glaze, and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color, glaze, and pattern>** .
- 11. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
- 12. Precoat with temporary protective coating.
- 13. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable [**and matching characteristics of adjoining flat tile**] . Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .
 - b. Wainscot Cap: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it; same size as adjoining flat tile.
 - d. External Corners: Surface bullnose, module size **[same as adjoining flat tile]<Insert size>** .
 - e. Internal Corners: Field-buttet square corners.
 - f. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from **1/2 to 1/4 inch (12.7 to 6.4 mm)** across nominal **4-inch (102-mm)** dimension.

2.6 CERAMIC MOSAIC TILES

A. Ceramic Mosaic Tile :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Crossville, Inc.]**
 - c. **[Daltile; a brand of Dal-Tile Corporation]**
 - d. **[Jeffrey Court Inc.]**
 - e. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - f. **[Portobello America, Inc.]**
 - g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Crossville, Inc.]**
 - c. **[Daltile; a brand of Dal-Tile Corporation]**
 - d. **[Jeffrey Court Inc.]**
 - e. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - f. **[Portobello America, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Type: **[Unglazed][Glazed][Chemical resistant]** .
4. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
5. Module Face Size: **[1 by 1 inch (25.4 by 25.4 mm)][1 by 2 inches (25.4 by 50.8 mm)][2 by 2 inches (50.8 by 50.8 mm)]<Insert dimensions>** .
6. Thickness: **1/4 inch (6.4 mm)**.
7. Face: **[Plain][Pattern of design indicated,]** with cushion edges.
8. Surface: **[Smooth, without][Slip resistant, with]** abrasive admixture.
9. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]** .
10. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. Chemical Reagent: **<Insert chemical reagent>** .
11. Tile Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>** .
12. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
13. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **[and matching characteristics of adjoining flat tile]** . Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved, module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)]<Insert dimensions>** .
 - b. Base Cap for Portland Cement Mortar Installations: Bead (bullnose), module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)]<Insert dimensions>** .
 - c. Base Cap for Thinset Mortar Installations: Surface bullnose, module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)][2 by 2 inches (50.8 by 50.8 mm)]<Insert dimensions>** .
 - d. Wainscot Cap for Portland Cement Mortar Installations: Bead (bullnose), module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)]<Insert dimensions>** .
 - e. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)][2 by 2 inches (50.8 by 50.8 mm)]<Insert dimensions>** .
 - f. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it; same size as adjoining flat tile.
 - g. External Corners for Portland Cement Mortar Installations: Bead (bullnose), module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)]<Insert dimensions>** .
 - h. External Corners for Thinset Mortar Installations: Surface bullnose, module size **[1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)][2 by 2 inches (50.8 by 50.8 mm)]<Insert dimensions>** .
 - i. Internal Corners:

- 1) Coved: Module size [1 by 1 inch (25.4 by 25.4 mm)][2 by 1 inch (50.8 by 25.4 mm)]<Insert dimensions> .
 - 2) Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
- j. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (102-mm) dimension.

2.7 GLAZED WALL TILES

A. Glazed Wall Tile :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [American Olean; a brand of Dal-Tile Corporation]
 - b. [Crossville, Inc.]
 - c. [Daltile; a brand of Dal-Tile Corporation]
 - d. [Interceramic]
 - e. [Jeffrey Court Inc.]
 - f. [Marazzi USA; a brand of Dal-Tile Corporation]
 - g. [Vitromex USA, Inc.]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Olean; a brand of Dal-Tile Corporation]
 - b. [Crossville, Inc.]
 - c. [Daltile; a brand of Dal-Tile Corporation]
 - d. [Interceramic]
 - e. [Jeffrey Court Inc.]
 - f. [Marazzi USA; a brand of Dal-Tile Corporation]
 - g. [Vitromex USA, Inc.]
 - h. <Insert manufacturer's name>
3. Module Face Size: [4-1/4 by 4-1/4 inches (108 by 108 mm)][6 by 4-1/4 inches (152 by 108 mm)][6 by 6 inches (152 by 152 mm)]<Insert dimensions> .
4. Face Size Variation: Rectified.
5. Thickness: 5/16 inch (8 mm).
6. Tile Color and Pattern: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern> .
7. Grout Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color> .
8. Mounting: [Loose tiles][Factory, back mounted][PregROUTED sheets of tile, factory assembled and grouted with manufacturer's standard white silicone rubber] .
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable [and matching characteristics of adjoining flat tile] . Provide shapes as follows, selected from manufacturer's standard shapes:

- a. Base for Portland Cement Mortar Installations: Coved, module size [4-1/4 by 4-1/4 inches (108 by 108 mm)][6 by 6 inches (152 by 152 mm)][6 by 3-3/4 inches (152 by 95 mm)]<Insert dimensions> .
- b. Base for Thinset Mortar Installations: Straight, module size [4-1/4 by 4-1/4 inches (108 by 108 mm)][6 by 6 inches (152 by 152 mm)][6 by 2 inches (152 by 50.8 mm)]<Insert dimensions> .
- c. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap, module size [4-1/4 by 4-1/4 inches (108 by 108 mm)][6 by 6 inches (152 by 152 mm)][6 by 2 inches (152 by 50.8 mm)]<Insert dimensions> .
- d. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size [4-1/4 by 4-1/4 inches (108 by 108 mm)][6 by 6 inches (152 by 152 mm)][6 by 2 inches (152 by 50.8 mm)]<Insert dimensions> .
- e. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it; same size as adjoining flat tile.
- f. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch (19 mm) unless otherwise indicated.
- g. External Corners for Thinset Mortar Installations: Surface bullnose; same size as adjoining flat tile.
- h. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

B. Accessories: Provide vitreous china accessories of type and size indicated; suitable for installing by same method as used for adjoining wall tile.

1. One soap holder [**with grab handle**] for each shower and tub indicated.
2. One paper holder at each water closet.
3. Color and Finish: [**Match adjoining glazed wall tile**][**As indicated by manufacturer's designations**][**Match Architect's sample**][**As selected by Architect from manufacturer's full range**][**White, bright glaze**]<Insert color and finish> .

2.8 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Profile: Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Granite Thresholds: ASTM C615/C615M.

1. Finish: [**Polished**][**Honed**]<Insert finish> .
2. Description:
 - a. Uniform, [**fine**][**medium**] -grained, [**white**][**gray**][**black**]<Insert color> stone without veining.
 - b. Match Architect's sample.
 - c. <Insert name of variety> provided by <Insert producer, distributor, or importer> .

C. Marble Thresholds: ASTM C503/C503M.

1. Finish: Honed.
2. Minimum Abrasion Resistance: [**10**][**12**] in accordance with ASTM C1353/C1353M or ASTM C241/C241M.

3. Description:

- a. Uniform, fine- to medium-grained white stone with gray veining.
- b. Match Architect's sample.
- c. **<Insert name of variety>** provided by **<Insert producer, distributor, or importer>** .

D. Slate Thresholds: ASTM C629/C629M, with fine, even grain.

- 1. Finish: Honed.
- 2. Classification: **[I Exterior][II Interior]** .
- 3. Description:
 - a. Uniform, **[black][blue-black][gray][blue-gray][green]<Insert color>** stone **[and unfading]** .
 - b. Match Architect's sample.
 - c. **<Insert name of variety>** provided by **<Insert producer, distributor, or importer>** .

E. Solid-Surface Thresholds: Homogeneous-filled plastic resin complying with ISFA-02-01.

- 1. Type: Provide **[Standard][Special Purpose]** type.
- 2. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]** .

2.9 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
- 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type**

X][Type C as required by fire-resistance-rated assembly indicated on Drawings] .

- B. Glass-Mat, Water-Resistant Gypsum Panel: ASTM C1658/C1658M, with fiberglass mat partially or completely embedded into the core.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :**
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - d. **[PABCO Gypsum]**
 - e. **[Panel Rey]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), abuse resistant] .**
 4. Long Edges: Tapered.
 5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- C. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: ASTM C1178/C1178M, with a water-resistant coating on one surface, and manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :**
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[USG Corporation]**

- d. <Insert manufacturer's name>
3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X] .
4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- D. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [C-Cure]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Custom Building Products]
 - d. [FinPan, Inc.]
 - e. [James Hardie Building Products, Inc.]
 - f. [PermaBASE Building Products, LLC provided by National Gypsum Company]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [C-Cure]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Custom Building Products]
 - d. [FinPan, Inc.]
 - e. [James Hardie Building Products, Inc.]
 - f. [PermaBASE Building Products, LLC provided by National Gypsum Company]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 3. Thickness: [1/4 inch (6.4 mm)][1/2 inch (12.7 mm)][5/8 inch (15.9 mm)][As indicated on Drawings] .
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- E. Joint Treatment Materials for Tile Backing Panels: Comply with ASTM C475/C475M requirements.
 1. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant panel products.
 2. Joint Tape: As recommended in writing by panel manufacturer.
 3. Joint Compound for Tile Backing Panels: [Use setting-type taping compound and setting-type, sandable topping compound][As recommended in writing by tile backing panel manufacturer] .

2.10 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product [, **selected from the following,**] that complies with ANSI A118.10 [**and ANSI A118.12**] and is recommended in writing by manufacturer for application indicated. Include reinforcement and accessories recommended in writing by manufacturer.

- B. Waterproof Membrane, Sheet: Polyethylene sheet faced on one or both sides with polyester fabric.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **[Noble Company (The)]**
 - f. **[Schluter Systems L.P.]**
 - g. **[Schonox HPS North America, Inc.]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **[Noble Company (The)]**
 - f. **[Schluter Systems L.P.]**
 - g. **[Schonox HPS North America, Inc.]**
 - h. **<Insert manufacturer's name>**
 3. Nominal Thickness: **[0.02 inch (0.5 mm)][0.03 inch (0.8 mm)][0.008 inch (0.2 mm)]<Insert thickness>** .
- C. Waterproof Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[National Applied Construction Products, Inc.]**
 - j. **[Noble Company (The)]**
 - k. **[Parex, a Sika brand]**
 - l. **[Proflex USA]**
 - m. **[Schonox HPS North America, Inc.]**
 - n. **[Sika Corporation]**
 - o. **[Southern Grouts & Mortars, Inc]**
 - p. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[National Applied Construction Products, Inc.]**
 - j. **[Noble Company (The)]**
 - k. **[Parex, a Sika brand]**
 - l. **[Proflex USA]**
 - m. **[Schonox HPS North America, Inc.]**
 - n. **[Sika Corporation]**
 - o. **[Southern Grouts & Mortars, Inc]**
 - p. **<Insert manufacturer's name>**
3. Reinforcement: **[Continuous fabric reinforcement][None]** .

2.11 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product [, **selected from the following,**] that complies with ANSI A118.12 for **[standard performance][high performance]** and is recommended in writing by manufacturer for application indicated. Include reinforcement and accessories recommended in writing by manufacturer.
- B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with polyester fabric.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Custom Building Products]**
 - b. **[Laticrete International, Inc.]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Proflex USA]**
 - f. **[Schluter Systems L.P.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Custom Building Products]**
 - b. **[Laticrete International, Inc.]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Proflex USA]**
 - f. **[Schluter Systems L.P.]**

- g. <Insert manufacturer's name>
- C. Crack Isolation Membrane, Asphaltic Sheet: Self-adhering, modified-asphalt sheet.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **[National Applied Construction Products, Inc.]**
 - f. **[Sika Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **[National Applied Construction Products, Inc.]**
 - f. **[Sika Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Facing: **[Fabric reinforcement][None]** .
- D. Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Bostik; Arkema]**
 - b. **[C-Cure]**
 - c. **[Custom Building Products]**
 - d. **[H.B. Fuller Construction Products Inc. / TEC]**
 - e. **[Jamo Inc]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - j. **[Sika Corporation]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Bostik; Arkema]
- b. [C-Cure]
- c. [Custom Building Products]
- d. [H.B. Fuller Construction Products Inc. / TEC]
- e. [Jamo Inc]
- f. [Laticrete International, Inc.]
- g. [MAPEI Corporation]
- h. [Parex, a Sika brand]
- i. [Siena Tile & Stone Installation Products; Omega Products International]
- j. [Sika Corporation]
- k. [Southern Grouts & Mortars, Inc]
- l. <Insert manufacturer's name>

3. Reinforcement: [Continuous fabric reinforcement][None] .

2.12 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Installer's option of material that complies with ANSI A108.02, paragraph 3.8.
2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, **2 by 2 inches (50.8 by 50.8 mm)** by **0.062-inch (1.57-mm)** diameter; comply with ASTM A1064/A1064M except for minimum wire size.
3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self-furring.
 - e. Weight: [2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)] .
4. Latex Additive: [Manufacturer's standard][acrylic resin][or][styrene-butadiene-rubber] water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended in writing by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Proflex USA]

- k. [Siena Tile & Stone Installation Products; Omega Products International]
- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Proflex USA]
- k. [Siena Tile & Stone Installation Products; Omega Products International]
- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.1.

C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Proflex USA]
- k. [Schluter Systems L.P.]
- l. [Siena Tile & Stone Installation Products; Omega Products International]
- m. [Southern Grouts & Mortars, Inc]
- n. [Summitville Tiles, Inc.]
- o. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]

- b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Proflex USA]
 - k. [Schluter Systems L.P.]
 - l. [Siena Tile & Stone Installation Products; Omega Products International]
 - m. [Southern Grouts & Mortars, Inc]
 - n. [Summitville Tiles, Inc.]
 - o. <Insert manufacturer's name>
 3. Dry-Mortar Mix with Additive: Provide prepackaged, dry-mortar mix containing dry, redispersible, [vinyl acetate][or][acrylic] additive to which only water must be added at Project site.
 4. Dry-Mortar Mix with Liquid-Latex Additive: Provide prepackaged, dry-mortar mix combined with [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.
 5. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.
- D. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Proflex USA]
 - h. [Siena Tile & Stone Installation Products; Omega Products International]
 - i. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Proflex USA]
 - h. [Siena Tile & Stone Installation Products; Omega Products International]
 - i. <Insert manufacturer's name>
 3. Dry-Mortar Mix with Additive: Provide prepackaged, dry-mortar mix containing dry, redispersible, [vinyl acetate][or][acrylic] additive to which only water must be added at Project site.
 4. Dry-Mortar Mix with Liquid-Latex Additive: Provide prepackaged, dry-mortar mix combined with

5. [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.
For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.15.

E. EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar (Thinset): ANSI A118.11.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [ARDEX Americas]
 - b. [C-Cure]
 - c. [Custom Building Products]
 - d. [H.B. Fuller Construction Products Inc. / TEC]
 - e. [Laticrete International, Inc.]
 - f. [MAPEI Corporation]
 - g. [Parex, a Sika brand]
 - h. [Proflex USA]
 - i. [Southern Grouts & Mortars, Inc]
 - j. [Summitville Tiles, Inc.]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [C-Cure]
 - c. [Custom Building Products]
 - d. [H.B. Fuller Construction Products Inc. / TEC]
 - e. [Laticrete International, Inc.]
 - f. [MAPEI Corporation]
 - g. [Parex, a Sika brand]
 - h. [Proflex USA]
 - i. [Southern Grouts & Mortars, Inc]
 - j. [Summitville Tiles, Inc.]
 - k. <Insert manufacturer's name>
3. Dry-Mortar Mix with Additive: Provide prepackaged, dry-mortar mix containing dry, redispersible, [vinyl acetate][or][acrylic additive] to which only water must be added at Project site.
4. Dry-Mortar Mix with Liquid-Latex Additive: Provide prepackaged, dry-mortar mix combined with [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.

F. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [ARDEX Americas]
 - b. [Atlas Minerals & Chemicals, Inc]
 - c. [Bostik; Arkema]
 - d. [C-Cure]

- e. **[Custom Building Products]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Southern Grouts & Mortars, Inc]**
 - j. **[Summitville Tiles, Inc.]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[ARDEX Americas]**
 - b. **[Atlas Minerals & Chemicals, Inc]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Southern Grouts & Mortars, Inc]**
 - j. **[Summitville Tiles, Inc.]**
 - k. **<Insert manufacturer's name>**
3. Verify adhesives have a VOC content of **[65]<Insert number>** g/L or less.
4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
6. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
7. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 and 212 deg F (60 and 100 deg C)**, respectively, and certified by manufacturer for intended use.
- G. Organic Adhesive: ANSI A136.1, Type **[I][II]** .
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[ARDEX Americas]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**

- i. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - j. **[Southern Grouts & Mortars, Inc]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - j. **[Southern Grouts & Mortars, Inc]**
 - k. **<Insert manufacturer's name>**
 3. Verify adhesives have a VOC content of **[65]<Insert number>** g/L or less.
 4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 6. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- H. Chemical-Resistant Furan Mortar: ANSI A118.5.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**

3. Filler Material: **[Carbon][Silica]<Insert material>** .

2.13 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Sakrete; CRH Americas, Oldcastle APG]**
 - k. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - l. **[Sika Corporation]**
 - m. **[Southern Grouts & Mortars, Inc]**
 - n. **[Summitville Tiles, Inc.]**
 - o. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Sakrete; CRH Americas, Oldcastle APG]**
 - k. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - l. **[Sika Corporation]**
 - m. **[Southern Grouts & Mortars, Inc]**
 - n. **[Summitville Tiles, Inc.]**
 - o. **<Insert manufacturer's name>**

- C. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following] :

- a. [ARDEX Americas]
- b. [Bostik; Arkema]
- c. [Custom Building Products]
- d. [H.B. Fuller Construction Products Inc. / TEC]
- e. [Laticrete International, Inc.]
- f. [MAPEI Corporation]
- g. [Parex, a Sika brand]
- h. [Proflex USA]
- i. [Southern Grouts & Mortars, Inc]
- j. [Summitville Tiles, Inc.]
- k. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]
- b. [Bostik; Arkema]
- c. [Custom Building Products]
- d. [H.B. Fuller Construction Products Inc. / TEC]
- e. [Laticrete International, Inc.]
- f. [MAPEI Corporation]
- g. [Parex, a Sika brand]
- h. [Proflex USA]
- i. [Southern Grouts & Mortars, Inc]
- j. [Summitville Tiles, Inc.]
- k. <Insert manufacturer's name>

3. Polymer Type: [Dry, redispersible form, prepackaged with other dry ingredients][Liquid-latex form for addition to prepackaged dry-grout mix] .

D. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Sika Corporation]
- k. [Southern Grouts & Mortars, Inc]
- l. [Summitville Tiles, Inc.]
- m. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Sika Corporation]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**
3. Maximum VOC Content: 65 g/L or less.
 4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 and 212 deg F (60 and 100 deg C)**, respectively, and certified by manufacturer for intended use.
- E. Chemical-Resistant Furan Grout: ANSI A118.5, with carbon filler.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**
- F. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.14 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, **4.0 mils (0.1 mm)** thick.
- C. Metal Flooring Transitions: Profile designed specifically for flooring applications; height to match tile and setting-bed thickness.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 3. Profile: **[L-shaped][Square]<Insert profile>** .
 4. Material and Finish: Metallic or combination of metal and PVC or neoprene base; **[chrome-plated brass][polished chrome anodized aluminum][polished nickel anodized aluminum][color-coated aluminum][half-hard brass][white zinc alloy]<Insert finish>** exposed-edge material.
 - a. Color: **[Brown][White][Gray]<Insert color>** .
- D. Metal Edge Trim: Profile designed for wall terminations and edge protection.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**

3. Profile: **[L-shaped][Square][Beveled]<Insert profile>** .
4. Terminations: **[End caps][Inside corners][Outside corners]** matching edge-protection profile.
5. Material and Finish: **[Chrome-plated brass][Polished chrome anodized aluminum][Polished nickel anodized aluminum][Color-coated aluminum]<Insert finish>** exposed-edge material.
 - a. Color: **[Brown][White][Gray]<Insert color>** .
- E. Temporary Protective Coating: Formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products and easily removable after grouting is completed without damaging grout or tile.
- F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- G. Grout Sealer: Grout manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with **[adhesives][bonded mortar bed][or][thinset mortar]** comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with **[adhesives][or][thinset mortar]** with trowelable leveling and patching compound specifically recommended in writing by tile-setting material manufacturer.

- C. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1 and is sloped **1/4 inch per foot (1:50)** toward drains.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- E. Substrate Flatness:
 - 1. For tile shorter than **15 inches (381 mm)**, confirm that structure or substrate is limited to variation of **1/4 inch in 10 ft. (6.4 mm in 3 m)** from the required plane, and no more than **1/16 inch in 12 inches (1.5 mm in 300 mm)** when measured from tile surface high points.
 - 2. For large format tile, tile with at least one edge **15 inches (381 mm)** or longer, confirm that structure or substrate is limited to **1/8 inch in 10 ft. (3 mm in 3 m)** from the required plane, and no more than **1/16 inch in 24 inches (1.5 mm in 609 mm)** when measured from tile surface high points.
- F. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM, GENERAL

- A. Tile Backing Panels: Install backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Waterproof Membranes: Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Crack Isolation Membranes: Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Setting and Grout Materials: Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - 1. Add materials, water, and additives in accurate proportions.
 - 2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
- E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in ANSI A108 series of tile installation standards

for providing 95 percent mortar coverage:

- a. Exterior tile floors and walls.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles **8 by 8 inches (200 by 200 mm)** or larger.
 - f. Tile floors consisting of rib-backed tiles.
2. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 3. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
 4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 6. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets, so joints between sheets are not apparent in finished Work.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- G. Thresholds: Install stone and solid surface thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in **[modified dry-set mortar (thinset)][improved modified dry-set mortar (thinset)]** .
 2. Do not extend **[cleavage membrane][waterproof membrane][or][crack isolation membrane]** under thresholds set in **[standard dry-set mortar (thinset)][modified dry-set mortar (thinset)][or][improved modified dry-set mortar (thinset)]** . Fill joints between such thresholds and adjoining tile set on **[cleavage membrane][waterproof membrane][or][crack isolation membrane]** with elastomeric sealant.
- H. Metal Flooring Transitions: Install **[at locations indicated][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated]** .

- I. Metal Wall Trim: Install at locations indicated on Drawings.
- J. Grout Sealer: Apply grout sealer to [**cementitious**] grout joints [**in tile floors**] in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 FIELD QUALITY CONTROL

- A. Water Test:
 - 1. Test of waterproofing membrane in showers and similar areas to be performed by Installation Contractor before setting tile.
 - a. Perform test after 24 hours of waterproof membrane installation.
 - b. Insert test plug in drain or waste line.
 - c. Fill shower base with water, high enough that the membrane-to-drain connection and floor-to-wall transition can be evaluated, and mark wall.
 - d. Check for leaks after 24 hours.
 - 2. Test to be witnessed by [Architect][authorities having jurisdiction]<Insert names or titles of witnesses> .
- B. Nonconforming Work:
 - 1. Waterproof membrane will be considered defective if water level has dropped.
 - 2. Remove and replace defective components and retest.

3.5 ADJUSTING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

3.6 CLEANING

- A. On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. Use only cleaners recommended in writing by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended in writing by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 EXTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Exterior Floor Installations:

1. TCNA F101: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) **[bonded to concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and bonded to concrete where membrane is not indicated]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid applied][Fabric reinforced, fluid applied]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.
2. TCNA F102: Thinset mortar **[on concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated][over crack isolation membrane on concrete][over crack isolation membrane on concrete where indicated and on concrete where membrane is not indicated]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Crack Isolation Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - g. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - h. Movement Joints: Types located on Drawings.

B. Exterior Roof/Deck Floor Installations:

1. TCNA F103: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed

(thickset) **[over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated]** over drainage material on roof membrane.

- a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.
2. TCNA F104: Thinset mortar **[on concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated][over crack isolation membrane on concrete][over crack isolation membrane on concrete where indicated and on concrete where membrane is not indicated]** .
- a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Thinset Mortar: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Crack Isolation Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - g. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - h. Movement Joints: Types located on Drawings.
- C. Exterior Wall Installations, Masonry or Concrete:
1. TCNA W201: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) installed on metal lath **[over waterproof membrane][over water-resistant barrier][over vapor-retarder membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout]** .

- 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Weather Barrier: Compliant with local code requirements **[and][specified in Division 07]** .
 - g. Vapor-Retarder Membrane: Compliant with local code requirements **[and][specified in Division 07]** .
 - h. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - i. Movement Joints: Types located on Drawings.
2. TCNA W202E: Thinset mortar **[over waterproof membrane][over water-resistive barrier][over vapor retarder membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Weather Barrier: Compliant with local code requirements **[and][specified in Division 07]** .
 - g. Vapor-Retarder Membrane: Compliant with local code requirements **[and][specified in Division 07]** .
 - h. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - i. Movement Joints: Types located on Drawings.
- D. Exterior Wall Installations, Wood or Metal Studs:
1. TCNA W244E: Thinset mortar **[over waterproof membrane on cementitious backer units][on cementitious backer units over vapor-retarder membrane][on cementitious backer units over water-resistive barrier]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Weather Barrier: Compliant with local code requirements **[and][specified in Division 07]** .
 - g. Vapor-Retarder Membrane: Compliant with local code requirements **[and][specified in Division 07]** .
 - h. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - i. Movement Joints: Types located on Drawings.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. TCNA F111: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) installed over cleavage membrane.
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - f. Movement Joints: Types located on Drawings.
2. TCNA F125-Full: Thinset mortar on crack isolation membrane.
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Crack Isolation Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.

B. Interior Floor Installations, Wood Subfloor:

1. TCNA F141: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) installed over cleavage membrane **[over waterproof membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement][Standard cement grout][High-performance sanded cement][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended in writing by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .

- f. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .
 - g. Movement Joints: Types located on Drawings.
 2. TCNA F142: Organic adhesive on plywood underlayment.
 - a. Location: .
 - b. Ceramic Tile Type: <Insert tile-type designation> .
 - c. Grout: [Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout] .
 - 1) Type: [Sanded][Unsanded] .
 - d. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .
 - e. Movement Joints: Types located on Drawings.
- C. Interior Radiant Heat Floor Installations, Concrete Subfloor:
 1. TCNA RH110: Thinset mortar [on crack isolation membrane] ; hydronic piping installed in concrete.
 - a. Location: .
 - b. Ceramic Tile Type: <Insert tile-type designation> .
 - c. Mortar: [Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)] .
 - d. Grout: [Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout] .
 - 1) Type: [Sanded][Unsanded] .
 - e. Crack Isolation Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane] .
 - f. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .
 - g. Movement Joints: Types located on Drawings.
 2. TCNA RH115: Thinset mortar; electric radiant system encapsulated in thinset mortar.
 - a. Location: .
 - b. Ceramic Tile Type: <Insert tile-type designation> .
 - c. Mortar: [Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)] .
 - d. Grout: [Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout] .
 - 1) Type: [Sanded][Unsanded] .
 - e. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .
 - f. Movement Joints: Types located on Drawings.
- D. Interior Radiant Heat Floor Installations, Wood Subfloor:
 1. TCNA RH130: Thinset mortar on exterior-glue plywood; electric radiant system encapsulated in

thinset mortar.

- a. Location: .
 - b. Ceramic Tile Type: <Insert tile-type designation> .
 - c. Mortar: **[EGP (exterior glue plywood) latex-portland cement mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - f. Movement Joints: Types located on Drawings.
2. TCNA RH141: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) installed over cleavage membrane **[and waterproof membrane]** with hydronic piping installed in mortar bed.
- a. Location: .
 - b. Ceramic Tile Type: <Insert stone tile-type designation> .
 - c. Bond Coat for Cured-Bed Method: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.

E. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I: Thinset mortar **[over waterproof membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: <Insert tile-type designation> .
 - c. Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)][Water-cleanable, tile-setting epoxy]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.

2. TCNA W211: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]** . Cement mortar bed (thickset) bonded to substrate **[over waterproof membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Bond Coat for Cured-Bed Method: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.
- F. Interior Wall Installations, Wood or Metal Studs or Furring:
1. TCNA W242: Organic adhesive on gypsum board.
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - d. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - e. Movement Joints: Types located on Drawings.
 2. TCNA W245: Thinset mortar on glass-mat, water-resistant gypsum backer board **[over waterproof membrane]** .
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Standard dry-set mortar][Modified dry-set mortar][Improved modified dry-set mortar]** .
 - d. Grout: **[Sand-portland cement grout][Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.
- G. Bathtub Wall Installations with No Shower Head, Wood or Metal Studs or Furring:
1. TCNA B413: **[Thinset mortar][Organic adhesive]** on **[water-resistant gypsum][coated glass-**

mat, water-resistant gypsum] backer board.

- a. Location: .
- b. Ceramic Tile Type: **<Insert tile-type designation>** .
- c. Thinset Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
- d. Grout: **[Sand-portland cement grout][Standard sanded cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
- e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
- f. Movement Joints: Types located on Drawings.

H. Bathtub/Shower Wall Installations:

- 1. TCNA B419: Thinset mortar **[over waterproof membrane]** on coated glass-mat, water-resistant gypsum backer board.
 - a. Location: .
 - b. Ceramic Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Standard cement grout][High-performance tile grout][Water-cleanable epoxy grout]** .
 - 1) Type: **[Sanded][Unsanded]** .
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.

3.10 CHEMICAL-RESISTANT TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete:

- 1. TCNA F115: Thinset mortar **[over crack isolation membrane]** .
 - a. Location: .
 - b. Chemical-Resistant Tile Type: **<Insert tile-type designation>** .
 - c. Mortar: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset)]** .
 - d. Grout: **[Water-cleanable epoxy grout][Chemical-resistant furan grout]** .
 - e. Crack Isolation Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]** .
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>** .
 - g. Movement Joints: Types located on Drawings.

2. TCNA F131: Water-cleanable, tile-setting epoxy.
 - a. Location: .
 - b. Chemical-Resistant Tile Type: **<Insert tile-type designation> .**
 - c. Grout: Water-cleanable epoxy grout.
 - d. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .**
 - e. Movement Joints: Types located on Drawings.
- B. Interior Wall Installations, Masonry or Concrete:
 1. TCNA W211: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C] .** Cement mortar bed (thickset) bonded to substrate **[over waterproof membrane] .**
 - a. Location: .
 - b. Chemical-Resistant Tile Type: **<Insert tile-type designation> .**
 - c. Bond Coat for Cured-Bed Method: **[Dry-set][Latex-]** portland cement mortar.
 - d. Grout: Water-cleanable epoxy.
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane] .**
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .**
 - g. Movement Joints: Types located on Drawings.
- C. Interior Wall Installations, Solid Backing:
 1. TCNA W222: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C] .** One-coat cement mortar bed (thickset) installed **[over cleavage membrane][over waterproof membrane]** on solid backing.
 - a. Location: .
 - b. Chemical-Resistant Tile Type: **<Insert tile-type designation> .**
 - c. Bond Coat for Cured-Bed Method: **[Standard dry-set mortar (thinset)][Modified dry-set mortar (thinset)][Improved modified dry-set mortar (thinset] .**
 - d. Grout: Water-cleanable epoxy grout.
 - e. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane] .**
 - f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width> .**
 - g. Movement Joints: Types located on Drawings.

END OF SECTION 09 30 13 00



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Task	Specification	Specification Description
09 30 16 00	09 30 13 00	Ceramic Tiling



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SECTION 09 30 23 00 - GLASS TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Large-format glass tile.
2. Mosaic glass tile.
3. Miniature mosaic glass tile.
4. Tile backing panels.
5. Waterproof membranes.
6. Crack isolation membranes.
7. Setting materials.
8. Grout materials.

B. Related Requirements:

1. **[Section 071326 "Self-Adhering Sheet Waterproofing"]****[Section 071353 "Elastomeric Sheet Waterproofing"]****[Section 071354 "Thermoplastic Sheet Waterproofing"]****[Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"]****[Section 071416 "Cold Fluid-Applied Waterproofing"]** for waterproofing under thickset mortar beds.
2. Section 079200 "Joint Sealants" for sealing movement joints in tile surfaces.
3. Section 092400 "Cement Plastering" for scratch coat for thickset mortar setting-bed installations.
4. Section 092613 "Gypsum Veneer Plastering" for cementitious backer units.
5. Section 092900 "Gypsum Board" for tile backing panels.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.2 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Large-Format Glass Tile: Glass tile with a surface area greater than **8.95 sq. inches (5776 sq. mm)**.
- D. Miniature Mosaic Glass Tile: Factory-mounted glass tile with a surface area less than or equal to **0.68 sq. inch (441 sq. mm)** or greater.
- E. Module Size: Actual tile size plus joint width indicated.
- F. Mosaic Glass Tile: Factory mounted glass tile with a surface area greater than **0.68 sq. inch (441 sq. mm)** but less than or equal to **8.95 sq. inches (5776 sq. mm)**.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Indicate widths, details, and locations of movement joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. **[For glass tile in color blend patterns, provide full sheets of each color blend.][For tile with aesthetic classification V3 or V4, provide 12 tiles from same production run.]**
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least **[12 inches (300 mm) square][36 inches (900 mm) square]<Insert size>**, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
- E. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, including product use classification.
- D. Product Test Reports:
 - 1. For tile-setting and -grouting products.
 - 2. Slip-resistance test reports from qualified independent testing agency.
- E. Field Quality-Control Reports: Water test reports of membrane in wet areas.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile Units: **[Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.]**
 - a. **<Insert, in separate subparagraphs, tile-type designation or description and quantity required for each category of tile for which extra material is required>.**
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition,

and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is **[a Five-Star member of the National Tile Contractors Association][or][a Trowel of Excellence member of the Tile Contractors' Association of America]**.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs only **[Ceramic Tile Education Foundation Certified Installers][or][installers recognized by the U.S. Department of Labor as Journeyman Tile Layers]** for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of **[mud floors][mud walls][membranes][shower receptors][and][large-format tile]**.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of **[each type of]** floor tile installation.
2. Build mockup of **[each type of]** wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.2 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.
 1. Warranty Period: **[Five years][10 years][25 years][Lifetime]** from date of Product Purchase.

PART 2 - PRODUCTS
2.1 SOURCE LIMITATIONS

- A. Tile: Obtain **[tile of each type and color or finish][tile of each type][tile of each color or finish][tile]** from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Custom Building Products]**
 - c. **[Laticrete International, Inc.]**
 - d. **[MAPEI Corporation]**
 - e. **<Insert manufacturer's name>**
 - 3. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
 - 4. Obtain underlayment from manufacturer of setting and grouting materials.
 - 5. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
 - 6. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. Accessory Products: Obtain the following products specified in this Section from a single manufacturer:
 - 1. Backer units.

2.2 PRODUCTS, GENERAL

- A. ANSI Glass Tile Standard: Provide glass tile that complies with ANSI A137.2 for types and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods

specified in tile installation schedules, and other requirements specified.

- C. **Factory Blending:** For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. **Mounting:** For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation **[on exteriors][or][in wet areas]**, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 LARGE-FORMAT GLASS TILE

- A. Large-Format Glass Tile Type : **[Cast][Fused][Low temperature]**.

- 1. **Manufacturers:** Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Interstyle Ceramic & Glass]**
 - c. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - d. **[Oceanside Glass & Tile]**
 - e. **[Sonoma Tilemakers]**
 - f. **<Insert manufacturer's name>**
- 2. **Basis-of-Design Product:** Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Olean; a brand of Dal-Tile Corporation]**
 - b. **[Interstyle Ceramic & Glass]**
 - c. **[Marazzi USA; a brand of Dal-Tile Corporation]**
 - d. **[Oceanside Glass & Tile]**
 - e. **[Sonoma Tilemakers]**
 - f. **<Insert manufacturer's name>**
- 3. **Face Size:** **[3 by 3 inches (76 by 76 mm)][4 by 4 inches (102 by 102 mm)][4-1/4 by 4-1/4 inches (108 by 108 mm)]<Insert dimensions>**.
- 4. **Sizing Category:** **[Standard][Natural]**.
- 5. **Aesthetic Class:** **[V0][V1][V2][V3][V4]**.
- 6. **Product Use Classification:** **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]**.
- 7. **Physical Properties:** Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. **<Insert chemical reagent>**.
- 8. **Tile Color and Pattern:** **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- 9. **Grout Color:** **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.

2.4 MOSAIC GLASS TILE

- A. Mosaic Glass Tile Type : Factory mounted, **[cast][fused][low temperature]**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Glass Mosaics]**
 - b. **[American Olean; a brand of Dal-Tile Corporation]**
 - c. **[Interstyle Ceramic & Glass]**
 - d. **[Oceanside Glass & Tile]**
 - e. **[Sonoma Tilemakers]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Glass Mosaics]**
 - b. **[American Olean; a brand of Dal-Tile Corporation]**
 - c. **[Interstyle Ceramic & Glass]**
 - d. **[Oceanside Glass & Tile]**
 - e. **[Sonoma Tilemakers]**
 - f. **<Insert manufacturer's name>**
 3. Module Size: **[1/2 by 2 inches (12.7 by 50.8 mm)][1/2 by 3 inches (12.7 by 76 mm)][5/8 by 1-1/4 inches (16 by 32 mm)][1 by 1 inch (25.4 by 25.4 mm)][1 by 2 inches (25.4 by 50.8 mm)][2 by 2 inches (50.8 by 50.8 mm)][2 by 4 inches (50.8 by 102 mm)]<Insert dimensions>**.
 4. Sizing Category: **[Standard][Natural]**.
 5. Aesthetic Class: **[V0][V1][V2][V3][V4]**.
 6. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]**.
 7. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. **<Insert chemical reagent>**.
 8. Tile Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
 9. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.

2.5 MINIATURE MOSAIC GLASS TILE

- A. Miniature Mosaic Glass Tile Type : Factory mounted, **[cast][fused][low temperature]**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[American Glass Mosaics]**
 - b. **[Oceanside Glass & Tile]**
 - c. **[Sonoma Tilemakers]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Glass Mosaics]**
 - b. **[Oceanside Glass & Tile]**
 - c. **[Sonoma Tilemakers]**
 - d. **<Insert manufacturer's name>**
3. Module Size: **[1/2 by 1/2 inch (12.7 by 12.7 mm)][1/2 by 1 inch (12.7 by 25.4 mm)][5/8 by 5/8 inch (16 by 16 mm)][3/4 by 3/4 inches (19 by 19 mm)]<Insert dimensions>**.
4. Sizing Category: **[Standard][Natural]**.
5. Aesthetic Class: **[V0][V1][V2][V3][V4]**.
6. Product Use Classification: **[Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)]**.
7. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 - a. **<Insert chemical reagent>**.
8. Tile Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
9. Grout Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.

2.6 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[C-Cure]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Custom Building Products]**
 - d. **[FinPan, Inc.]**
 - e. **[James Hardie Building Products, Inc.]**
 - f. **[PermaBASE Building Products, LLC provided by National Gypsum Company]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [C-Cure]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Custom Building Products]
 - d. [FinPan, Inc.]
 - e. [James Hardie Building Products, Inc.]
 - f. [PermaBASE Building Products, LLC provided by National Gypsum Company]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 3. Thickness: [1/4 inch (6.4 mm)][1/2 inch (12.7 mm)][5/8 inch (16 mm)][As indicated on Drawings].
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- B. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (16 mm), Type X][Type C as required by fire-resistance-rated assembly indicated on Drawings].
- C. Glass-Mat, Water-Resistant Gypsum Panel: ASTM C1658/C1658M, with fiberglass mat partially or completely embedded into the core.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]

- c. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - d. [PABCO Gypsum]
 - e. [Panel Rey]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]
 - c. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - d. [PABCO Gypsum]
 - e. [Panel Rey]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C][5/8 inch (16 mm), Type X][5/8 inch (16 mm), abuse resistant].
 4. Long Edges: Tapered.
 5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- D. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: ASTM C1178/C1178M, with a water-resistant coating on one surface, and manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]
 - c. [USG Corporation]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]
 - c. [USG Corporation]
 - d. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (16 mm), Type X].
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.7 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product[, **selected from the following,**] that complies with ANSI A118.10 [and ANSI A118.12]and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.

- B. Waterproof Membrane, Sheet: Polyethylene sheet faced on one or both sides with polyester fabric.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Schluter Systems L.P.]**
 - f. **[Schonox HPS North America, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Schluter Systems L.P.]**
 - f. **[Schonox HPS North America, Inc.]**
 - g. **<Insert manufacturer's name>**
- C. Waterproof Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer[**with continuous fabric reinforcement**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[National Applied Construction Products, Inc.]**
 - j. **[Noble Company (The)]**
 - k. **[Parex, a Sika brand]**
 - l. **[Sika Corporation]**
 - m. **[Southern Grouts & Mortars, Inc]**
 - n. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**

- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [National Applied Construction Products, Inc.]
- j. [Noble Company (The)]
- k. [Parex, a Sika brand]
- l. [Sika Corporation]
- m. [Southern Grouts & Mortars, Inc]
- n. <Insert manufacturer's name>

2.8 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product[, **selected from the following**,] that complies with ANSI A118.12 for [standard performance][high performance] and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with polyester fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Custom Building Products]
 - b. [Laticrete International, Inc.]
 - c. [MAPEI Corporation]
 - d. [Noble Company (The)]
 - e. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Custom Building Products]
 - b. [Laticrete International, Inc.]
 - c. [MAPEI Corporation]
 - d. [Noble Company (The)]
 - e. <Insert manufacturer's name>
- C. Crack Isolation Membrane, Asphaltic Sheet: Self-adhering, modified-asphalt sheet[**with fabric reinforcement facing**].
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Boiardi Products Corporation; a QEP company]
 - b. [Custom Building Products]
 - c. [MAPEI Corporation]
 - d. [National Applied Construction Products, Inc.]

- e. **[Sika Corporation; Flooring]**
- f. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Boiardi Products Corporation; a QEP company]**
- b. **[Custom Building Products]**
- c. **[MAPEI Corporation]**
- d. **[National Applied Construction Products, Inc.]**
- e. **[Sika Corporation; Flooring]**
- f. **<Insert manufacturer's name>**

- D. Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer[**with continuous fabric reinforcement**].

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Bostik; Arkema]**
- b. **[C-Cure]**
- c. **[Custom Building Products]**
- d. **[H.B. Fuller Construction Products Inc. / TEC]**
- e. **[Laticrete International, Inc.]**
- f. **[MAPEI Corporation]**
- g. **[Parex, a Sika brand]**
- h. **[Siena Tile & Stone Installation Products; Omega Products International]**
- i. **[Southern Grouts & Mortars, Inc]**
- j. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Bostik; Arkema]**
- b. **[C-Cure]**
- c. **[Custom Building Products]**
- d. **[H.B. Fuller Construction Products Inc. / TEC]**
- e. **[Laticrete International, Inc.]**
- f. **[MAPEI Corporation]**
- g. **[Parex, a Sika brand]**
- h. **[Siena Tile & Stone Installation Products; Omega Products International]**
- i. **[Southern Grouts & Mortars, Inc]**
- j. **<Insert manufacturer's name>**

2.9 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02[; **use white cement unless otherwise indicated**].

- 1. Cleavage Membrane: Installers option of material that complies with ANSI A108.02, paragraph

- 3.8.
 2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, **2 by 2 inches (50.8 by 50.8 mm)** by **0.062-inch (1.57-mm)** diameter; comply with ASTM A1064/A1064M except for minimum wire size.
 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self-furring.
 - e. Weight: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**.
 4. Latex Additive: **[Manufacturer's standard][acrylic resin][or][styrene-butadiene-rubber]** water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1[; **white, unless otherwise indicated**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**

3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- C. Modified Dry-Set Mortar (Thinset): ANSI A118.4[; **white, unless otherwise indicated**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**
 3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 4. Provide prepackaged, dry-mortar mix combined with **[acrylic resin][or][styrene-butadiene-rubber]** liquid-latex additive at Project site.
 5. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- D. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15[; **white, unless otherwise indicated**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Siena Tile & Stone Installation Products; Omega Products International]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Siena Tile & Stone Installation Products; Omega Products International]
 - h. <Insert manufacturer's name>
 3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 4. Provide prepackaged, dry-mortar mix combined with [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.
 5. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.
- E. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Atlas Minerals & Chemicals, Inc]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Jamo Inc]
 - h. [Laticrete International, Inc.]
 - i. [MAPEI Corporation]
 - j. [Parex, a Sika brand]
 - k. [Sakrete; CRH Americas, Oldcastle APG]
 - l. [Southern Grouts & Mortars, Inc]
 - m. [Summitville Tiles, Inc.]
 - n. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]

- b. [Atlas Minerals & Chemicals, Inc]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Jamo Inc]
- h. [Laticrete International, Inc.]
- i. [MAPEI Corporation]
- j. [Parex, a Sika brand]
- k. [Sakrete; CRH Americas, Oldcastle APG]
- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

- 3. Verify adhesives have a VOC content of [65]<Insert number> g/L or less.
- 4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 5. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
- 6. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

F. Organic Adhesive: ANSI A136.1, [Type I][Type II].

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Bostik; Arkema]
 - c. [C-Cure]
 - d. [Custom Building Products]
 - e. [H.B. Fuller Construction Products Inc. / TEC]
 - f. [Jamo Inc]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Sakrete; CRH Americas, Oldcastle APG]
 - j. [Siena Tile & Stone Installation Products; Omega Products International]
 - k. [Southern Grouts & Mortars, Inc]
 - l. [Summitville Tiles, Inc.]
 - m. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Bostik; Arkema]

- c. [C-Cure]
 - d. [Custom Building Products]
 - e. [H.B. Fuller Construction Products Inc. / TEC]
 - f. [Jamo Inc]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Sakrete; CRH Americas, Oldcastle APG]
 - j. [Siena Tile & Stone Installation Products; Omega Products International]
 - k. [Southern Grouts & Mortars, Inc]
 - l. [Summitville Tiles, Inc.]
 - m. <Insert manufacturer's name>
- 3. Verify adhesives have a VOC content of [65]<Insert number> g/L or less.
 - 4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 5. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 6. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.10 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Jamo Inc]
 - h. [Laticrete International, Inc.]
 - i. [MAPEI Corporation]
 - j. [Sakrete; CRH Americas, Oldcastle APG]
 - k. [Siena Tile & Stone Installation Products; Omega Products International]
 - l. [Sika Corporation]
 - m. [Southern Grouts & Mortars, Inc]
 - n. [Summitville Tiles, Inc.]
 - o. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Jamo Inc]
- h. [Laticrete International, Inc.]
- i. [MAPEI Corporation]
- j. [Sakrete; CRH Americas, Oldcastle APG]
- k. [Siena Tile & Stone Installation Products; Omega Products International]
- l. [Sika Corporation]
- m. [Southern Grouts & Mortars, Inc]
- n. [Summitville Tiles, Inc.]
- o. <Insert manufacturer's name>

C. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Jamo Inc]
 - h. [Laticrete International, Inc.]
 - i. [MAPEI Corporation]
 - j. [Sakrete; CRH Americas, Oldcastle APG]
 - k. [Southern Grouts & Mortars, Inc]
 - l. [Summitville Tiles, Inc.]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Jamo Inc]
 - h. [Laticrete International, Inc.]
 - i. [MAPEI Corporation]
 - j. [Sakrete; CRH Americas, Oldcastle APG]
 - k. [Southern Grouts & Mortars, Inc]

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2.11 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, **4.0 mils (0.1 mm)** thick.
- C. Metal Flooring Transitions: Profile designed specifically for flooring applications; height to match tile and setting-bed thickness.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 - 3. Description: **[L-shaped][Square]<Insert profile>**.
 - 4. Material and Finish: Metallic or combination of metal and PVC or neoprene base; **[chrome-plated brass][polished chrome anodized aluminum][polished nickel anodized aluminum][color-coated aluminum][half-hard brass][white zinc alloy]<Insert finish>** exposed-edge material.
 - a. Color: **[Brown][White][Gray]<Insert color>**.
- D. Metal Edge Trim: Profile designed for wall terminations and edge protection.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
3. Description: **[L-shaped][Square][Beveled]<Insert profile>**.
 4. Terminations: **[End caps][Inside corners][Outside corners]** matching edge-protection profile.
 5. Material and Finish: **[Chrome-plated brass][Polished chrome anodized aluminum][Polished nickel anodized aluminum][Color-coated aluminum]<Insert finish>** exposed-edge material.
 - a. Color: **[Brown][White][Gray]<Insert color>**.
- E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- F. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with **[adhesives][bonded mortar bed][or][thinset mortar]** comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting

materials.

- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with **[adhesives][or][thinset mortar]** with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- C. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot (1:50)** toward drains.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- E. Substrate Flatness: Confirm that structure or substrate is limited to variation of **1/4 inch in 10 ft. (6.4 mm in 3 m)** from the required plane, and no more than **1/16 inch in 12 inches (1.5 mm in 300 mm)** when measured from tile surface high points.

3.3 INSTALLATION OF GLASS TILING

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - 1. Add materials, water, and additives in accurate proportions.
 - 2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
- E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 - 2. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

3. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
4. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- G. Metal Flooring Transitions: Install **[at locations indicated][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated]**.
- H. Metal Wall Trim: Install at locations indicated.
- I. Grout Sealer: Apply grout sealer to grout joints in accordance with grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 FIELD QUALITY CONTROL

- A. Water Test:
 1. Test of waterproofing membrane in showers and similar areas to be performed by Installation Contractor before setting tile.
 - a. Perform test after 24 hours of waterproof membrane installation.
 - b. Insert test plug in drain or waste line.
 - c. Fill shower base with water, high enough that the membrane-to-drain connection and floor-to-wall transition can be evaluated, and mark wall.
 - d. Check for leaks after 24 hours.
 2. Test to be witnessed by **[Architect][authorities having jurisdiction]<Insert names or titles of witnesses>**.
- B. Nonconforming Work:
 1. Waterproof membrane will be considered defective if water level has dropped.
 2. Remove and replace defective components and retest.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 EXTERIOR GLASS TILE INSTALLATION SCHEDULE

- A. Exterior Wall Installations, Masonry or Concrete:
 - 1. TCNA W201 <Insert designation>: Method **[ANSI A108.14][ANSI A108.15][ANSI A108.16]**. Cement mortar bed (thickset) on metal lath **[over waterproof membrane][over water-resistant barrier][over vapor-retarder membrane]**.
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: **[Modified dry-set][Improved modified dry-set]** mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Water-Resistive Barrier: Compliant with local code requirements **[and][specified in Division 07]**.
 - f. Vapor Retarder: Compliant with local code requirements **[and][specified in Division 07]**.
 - g. Joint Width: **[3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - h. Movement Joints: Types located on Drawings.
 - 2. TCNA W202E <Insert designation>: Thinset mortar **[over waterproof membrane][over water-resistive barrier][over vapor retarder membrane]**.

- a. Glass Tile Type: <Insert tile-type designation>.
- b. Thinset Mortar: [Modified dry-set][Improved modified dry-set] mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
- c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement] grout, as recommended by tile and grout manufacturer.
- d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- e. Water-Resistive Barrier: Compliant with local code requirements [and][specified in Division 07].
- f. Vapor Retarder: Compliant with local code requirements [and][specified in Division 07].
- g. Joint Width: [3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
- h. Movement Joints: Types located on Drawings.

3.8 INTERIOR GLASS TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I <Insert designation>: Thinset mortar[over waterproof membrane].
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [Modified dry-set][Improved modified dry-set][Water-cleanable epoxy] mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
 - c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
 - f. Movement Joints: Types located on Drawings.
2. TCNA W211 <Insert designation>: Method [ANSI A108.14][ANSI A108.15][ANSI A108.16] Cement mortar bed (thickset) on metal lath [over cleavage membrane][over waterproof membrane].
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Modified dry-set][Improved modified dry-set][Water-cleanable epoxy] mortar.
 - 1) Color: <Insert color>.
 - c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
 - f. Movement Joints: Types located on Drawings.

B. Interior Wall Installations, Wood or Metal Studs or Furring:

1. TCNA W245 <Insert designation>: Thinset mortar on glass-mat, water-resistant gypsum backer board [**over waterproof membrane**].
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [**Modified dry-set**] [**Improved modified dry-set**] mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
 - c. Grout: [**Sand-portland cement**] [**Standard sanded cement**] [**Standard unsanded cement**] [**High-performance sanded cement**] [**High-performance unsanded cement**] [**Water-cleanable epoxy**] grout.
 - d. Waterproof Membrane: [**As recommended by setting material manufacturer**] [**Polyethylene sheet**] [**Fluid-applied membrane**] [**Fabric-reinforced, fluid-applied membrane**].
 - e. Joint Width: [**1/8 inch (3.2 mm)**] [**3/16 inch (4.76 mm)**] [**1/4 inch (6.4 mm)**] [**3/8 inch (9.5 mm)**] <Insert width>.
 - f. Movement Joints: Types located on Drawings.
2. TCNA W243 <Insert designation>: Thinset mortar on gypsum board.
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [**Modified dry-set**] [**Improved modified dry-set**] mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
 - c. Grout: [**Standard sanded cement**] [**Standard unsanded cement**] [**High-performance sanded cement**] [**High-performance unsanded cement**] [**Water-cleanable epoxy**] grout.
 - d. Joint Width: [**3/16 inch (4.76 mm)**] [**1/4 inch (6.4 mm)**] [**3/8 inch (9.5 mm)**] <Insert width>.
 - e. Movement Joints: Types located on Drawings.
3. TCNA W248 <Insert designation>: Thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [**Modified dry-set**] [**Improved modified dry-set**] mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: <Insert color>.
 - c. Grout: [**Standard sanded cement**] [**Standard unsanded cement**] [**High-performance sanded cement**] [**High-performance unsanded cement**] [**Water-cleanable epoxy**] grout.
 - d. Joint Width: [**3/16 inch (4.76 mm)**] [**1/4 inch (6.4 mm)**] [**3/8 inch (9.5 mm)**] <Insert width>.
 - e. Movement Joints: Types located on Drawings.

C. Bathtub Wall Installations with No Shower Head, Wood or Metal Studs:

1. TCNA B413 <Insert designation>: [**Thinset mortar**] [**Organic adhesive**] on [**water-resistant gypsum**] [**coated glass-mat, water-resistant gypsum**] board.
 - a. Glass Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [**Modified dry-set**] [**Improved modified dry-set**] mortar, as recommended

by tile and mortar manufacturer.

1) Color: **<Insert color>**.

- c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
- d. Joint Width: **[3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
- e. Movement Joints: Types located on Drawings.

D. Bathtub/Shower Wall Installations:

- 1. TCNA B419 **<Insert designation>**: **[Thinset mortar][Organic adhesive][over waterproof membrane]** on coated glass-mat, water-resistant gypsum backer board.
 - a. Glass Tile Type: **<Insert tile-type designation>**.
 - b. Thinset Mortar: **[Modified dry-set][Improved modified dry-set]** mortar, as recommended by tile and mortar manufacturer.
 - 1) Color: **<Insert color>**.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Joint Width: **[3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - f. Movement Joints: Types located on Drawings.

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SECTION 09 30 33 00 - STONE TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Granite tile.
2. Limestone tile.
3. Marble tile.
4. Quartz-based tile.
5. Slate tile.
6. Travertine tile.
7. Thresholds.
8. Tile backing panels.
9. Waterproof membranes.
10. Crack isolation membranes.
11. Setting materials.
12. Grout materials.

B. Related Requirements:

1. **[Section 035413 "Gypsum Cement Underlayment"]**[035416 "Hydraulic Cement Underlayment"] for application below interior floor coverings.
2. **[Section 071326 "Self-Adhering Sheet Waterproofing"]**[Section 071353 "Elastomeric Sheet Waterproofing"]**[Section 071354 "Thermoplastic Sheet Waterproofing"]**[Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"]**[Section 071416 "Cold Fluid-Applied Waterproofing"]** for waterproofing under thickset mortar beds.
3. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in stone tile surfaces.
4. Section 092400 "Cement Plastering" for scratch coat over metal lath on wall surfaces.
5. Section 092613 "Gypsum Veneer Plastering" for cementitious backer units.
6. Section 092900 "Gypsum Board" for tile backing panels.
7. Section 096340 "Stone Flooring" for dimension stone flooring other than thin modular dimension stone tile.
8. Section 097519 "Stone Trim" for stone base in the form of running trim rather than tile.

1.2 DEFINITIONS

- A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Dimension Stone Tile: Modular stone that has been selected and stock fabricated into units less than **3/4 inch (19 mm)** thick without any facial dimensions greater than **2 ft. (610 mm)**.
- C. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Granite tile.
 - 2. Limestone tile.
 - 3. Marble tile.
 - 4. Quartz-based tile
 - 5. Slate tile.
 - 6. Travertine tile.
 - 7. Thresholds.
 - 8. Tile backing panels.
 - 9. Waterproof membranes.
 - 10. Crack isolation membranes.
 - 11. Setting materials.
 - 12. Grout materials.
- B. Shop Drawings: Show locations of each type of stone tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in substrates and finished stone tile surfaces. **[Show stone thresholds.]**
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type of stone tile **[in each finish required]**.
 - 2. Assembled Samples with grouted joints for each type of stone tile **[and for each finish required]**, at least **[36 inches (900 mm) square]<Insert size>** and mounted on a rigid panel. Use grout of type and in color(s) approved for completed Work.
 - 3. Range Samples consisting of at least **[two][three][four][five]<Insert number>** full-size units of each type of stone tile, exhibiting extremes of the full range of color and other visual characteristics expected. Range Samples establish the standard by which individual stone tiles **[and thresholds]** are judged.
 - 4. Stone thresholds in **6-inch (150-mm)** lengths.
 - 5. Metal flooring transitions in **6-inch (150-mm)** lengths.
- E. Sustainable Design Submittals:
 - 1. Environmental Product Declaration: For each product.
 - 2. Health Product Declaration: For each product.
 - 3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 - 4. Environmental Product Declaration: For each product.
 - 5. Environmental Product Declaration: For each product.
 - 6. Environmental Product Declaration: For each product.
 - 7. Third-Party Certifications: For each product.
 - 8. Third-Party Certified Life Cycle Assessment: For each product.
 - 9. Product Data: For adhesives, indicating VOC content.
 - 10. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting

materials.

11. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports:
 1. Tile-setting and -grouting products.
 2. Slip-resistance test reports from qualified independent testing agency.
- C. Field Quality-Control Reports: Water test reports of membrane in wet areas.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Dimension Stone Tile: **[Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.]**
 - a. **<Insert, in separate subparagraphs, stone tile-type designation or description and quantity required for each category of stone tile for which extra material is required>.**
 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Installer is **[a Five-Star member of the National Tile Contractors Association][or][a Trowel of Excellence member of the Tile Contractors' Association of America]**.
 2. Installer's supervisor for Project holds the International Masonry Institute's Supervisor Certification.
 3. Installer employs only **[Ceramic Tile Education Foundation Certified Installers][or][installers recognized by the U.S. Department of Labor as Journeyman Tile Layers]** for Project.
 4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of **[mud floors][mud walls][membranes][shower receptors][and][large format tile]**.

1.8 MOCKUPS

- A. Build **[dry-laid]** mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockup **[as indicated on Drawings]****<Insert mockup requirements>.**

2. Maintain dry-laid mockups in an undisturbed condition until equivalent areas of the completed Work are approved to serve as mockups.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store stone tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stone tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to remove and replace defective installation areas, material and labor, that fail under normal usage within specified warranty period.
 1. Warranty Period: **[Five years][10 years][25 years][Lifetime]** from date of **[Product Purchase][Substantial Completion]**.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Stone Tile: Obtain **[tile of each type and color or finish][tile of each type][tile of each color or finish][tile]** from single source or producer.
 1. Where two or more stone product types are identical, except for size or finish, provide same variety for each type.
 2. Where threshold types are identical to stone tile types, except for size or finish, provide same variety.
- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [Laticrete International, Inc.]
 - d. [MAPEI Corporation]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [Laticrete International, Inc.]
 - d. [MAPEI Corporation]
 - e. <Insert manufacturer's name>
3. Obtain setting and grouting materials, except for unmodified cement and aggregate, from single manufacturer.
4. Obtain waterproof, crack isolation and other required membranes from manufacturer of setting and grouting materials.
5. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:
1. Stone thresholds.
 2. Backer units.

2.2 PRODUCTS, GENERAL

- A. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- B. Pattern Orientation: For stone varieties with a directional pattern, provide tile with pattern **[oriented parallel to one side of tile][randomly oriented at various angles to sides of tiles]**.
1. For stone varieties that exhibit a directional pattern, provide thresholds with pattern **[oriented parallel to][oriented at an angle of 45 degrees or less to][randomly oriented at various angles to]** long edges of thresholds.

2.3 GRANITE TILE

- A. Granite Tile Type :
1. Varieties and Sources: Subject to compliance with requirements, **[provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]**
 - a. <Insert manufacturer and tile names and modular sizes>.

2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][24 by 24 inches (609.6 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [12][25]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.4 LIMESTONE TILE

A. Limestone Tile Type :

1. Varieties and Sources: Subject to compliance with requirements, [provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]
 - a. <Insert manufacturer and tile names and modular sizes>.
2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][24 by 24 inches (609.6 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [10][12]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.5 MARBLE TILE

A. Marble Tile Type :

1. Varieties and Sources: Subject to compliance with requirements, [provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]
 - a. <Insert manufacturer and tile names and modular sizes>.
2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][24 by 24 inches (609.6 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [10][12]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.6 QUARTZ-BASED TILE

A. Quartz-Based Tile Type :

1. Varieties and Sources: Subject to compliance with requirements, [provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]

a. <Insert manufacturer and tile names and modular sizes>.

2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][24 by 24 inches (609.6 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [8][12]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.7 SLATE TILE

A. Slate Tile Type :

1. Varieties and Sources: Subject to compliance with requirements, [provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]

a. <Insert manufacturer and tile names and modular sizes>.

2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][18 by 24 inches (457 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [8][10]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.8 TRAVERTINE TILE

A. Travertine Tile Type :

1. Varieties and Sources: Subject to compliance with requirements, [provide the following:][provide one of the following:][match Architect's sample for color, finish, and other characteristics relating to aesthetic effects.]

a. <Insert, manufacturer and tile names and modular sizes>.

2. Module Size: [4 by 4 inches (102 by 102 mm)][6 by 6 inches (152 by 152 mm)][8 by 8 inches (200 by 200 mm)][18 by 24 inches (457 by 609.6)]<Insert size>.
3. Nominal Thickness: [3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert thickness>.
4. Abrasion Resistance of Stone Tile for Floors: Provide stone with a value of not less than [10][12]<Insert number> in accordance with ASTM C1353/C1353M or ASTM C241/C241M.
5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet Plus (IW+)][Exterior, Wet (EW)][Oil/Greases (O/G)].

2.9 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm)

above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to **1/2 inch (12.7 mm)** or less above adjacent floor surface.

B. Granite Thresholds: ASTM C615/C615M, with **[polished][honed]<Insert finish>** finish.

1. Description:

- a. Uniform, **[fine][medium]**-grained, **[white][gray][black]<Insert color>** stone without veining.
- b. Match Architect's sample.
- c. Match adjacent stone tile flooring.
- d. Provide **[one of]** the following:

- 1) **<Insert, in separate subparagraphs, name of variety and producer, distributor, or importer>.**

C. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of **[10][12]** in accordance with ASTM C1353/C1353M or ASTM C241/C241M and with honed finish.

1. Description:

- a. Uniform, fine- to medium-grained white stone with gray veining.
- b. Match Architect's sample.
- c. Match adjacent stone tile flooring.
- d. Provide **[one of]** the following:

- 1) **<Insert, in separate subparagraphs, name of variety and producer, distributor, or importer>.**

D. Slate Thresholds: ASTM C629/C629M, Classification **[I Exterior][II Interior]**, with fine, even grain and honed finish.

1. Description:

- a. Uniform, **[black][blue-black][gray][blue-gray][green]<Insert color>** stone **[and unfading]**.
- b. Match Architect's sample.
- c. Match adjacent stone tile flooring.
- d. Provide **[one of]** the following:

- 1) **<Insert, in separate subparagraphs, name of variety and producer, distributor, or importer>.**

E. Solid Surface Thresholds: Homogeneous-filled plastic resin complying with ISFA-02-01.

1. Description:

- a. Type: Provide **[Standard][Special Purpose]** type.
- b. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.

2.10 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[C-Cure]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Custom Building Products]**
 - d. **[FinPan, Inc.]**
 - e. **[James Hardie Building Products, Inc.]**
 - f. **[PermaBASE Building Products, LLC provided by National Gypsum Company]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[C-Cure]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Custom Building Products]**
 - d. **[FinPan, Inc.]**
 - e. **[James Hardie Building Products, Inc.]**
 - f. **[PermaBASE Building Products, LLC provided by National Gypsum Company]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 3. Thickness: **[1/4 inch (6.4 mm)][1/2 inch (12.7 mm)][5/8 inch (15.9 mm)][As indicated on Drawings].**
 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- B. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Gypsum]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Georgia-Pacific Gypsum LLC]**
 - d. **[Gold Bond Building Products, LLC provided by National Gypsum Company]**
 - e. **[PABCO Gypsum]**
 - f. **[Panel Rey]**
 - g. **[USG Corporation]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X][Type C as required by fire-resistance-rated assembly indicated on Drawings].
- C. Glass-Mat, Water-Resistant Gypsum Panel: ASTM C1658/C1658M, with fiberglass mat partially or completely embedded into the core.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]
 - c. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - d. [PABCO Gypsum]
 - e. [Panel Rey]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]
 - c. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - d. [PABCO Gypsum]
 - e. [Panel Rey]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 3. Core: [As indicated on Drawings][1/2 inch (12.7 mm), regular type][1/2 inch (12.7 mm), Type C][5/8 inch (15.9 mm), Type X][5/8 inch (15.9 mm), abuse resistant].
 4. Long Edges: Tapered.
 5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
- D. Coated Glass-Mat, Water-Resistant Gypsum Backing Panel: ASTM C1178/C1178M, with a water-resistant coating on one surface, and manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Georgia-Pacific Gypsum LLC]

- c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Georgia-Pacific Gypsum LLC]**
 - c. **[USG Corporation]**
 - d. **<Insert manufacturer's name>**
- 3. Core: **[As indicated on Drawings][1/2 inch (12.7 mm), regular type][5/8 inch (15.9 mm), Type X]**.
- 4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.11 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product[, **selected from the following,**] that complies with ANSI A118.10 **[and ANSI A118.12]**and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproof Membrane, Sheet: Polyethylene faced on both sides with polyester fabric.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Schluter Systems L.P.]**
 - f. **[Schonox HPS North America, Inc.]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Blanke Corporation]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Schluter Systems L.P.]**
 - f. **[Schonox HPS North America, Inc.]**
 - g. **<Insert manufacturer's name>**
- C. Waterproof Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer[**with continuous fabric reinforcement**].
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [National Applied Construction Products, Inc.]
 - j. [Parex, a Sika brand]
 - k. [Sika Corporation]
 - l. [Southern Grouts & Mortars, Inc]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [National Applied Construction Products, Inc.]
- j. [Parex, a Sika brand]
- k. [Sika Corporation]
- l. [Southern Grouts & Mortars, Inc]
- m. <Insert manufacturer's name>

2.12 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product[, **selected from the following**,] that complies with ANSI A118.12 for [standard performance][high performance] and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with polyester fabric.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Custom Building Products]
 - b. [Laticrete International, Inc.]
 - c. [MAPEI Corporation]
 - d. [Noble Company (The)]
 - e. [Schluter Systems L.P.]
 - f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Custom Building Products]**
 - b. **[Laticrete International, Inc.]**
 - c. **[MAPEI Corporation]**
 - d. **[Noble Company (The)]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
- C. Crack Isolation Membrane, Asphaltic Sheet: Self-adhering, modified-asphalt sheet[**with fabric reinforcement facing**].
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Custom Building Products]**
 - c. **[MAPEI Corporation]**
 - d. **[National Applied Construction Products, Inc.]**
 - e. **[Sika Corporation]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Custom Building Products]**
 - c. **[MAPEI Corporation]**
 - d. **[National Applied Construction Products, Inc.]**
 - e. **[Sika Corporation]**
 - f. **<Insert manufacturer's name>**
- D. Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer[**with continuous fabric reinforcement**].
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Jamo Inc]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Sika Corporation]**

- l. **[Southern Grouts & Mortars, Inc]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[ARDEX Americas]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Jamo Inc]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[Siena Tile & Stone Installation Products; Omega Products International]**
 - k. **[Sika Corporation]**
 - l. **[Southern Grouts & Mortars, Inc]**
 - m. **<Insert manufacturer's name>**

2.13 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

- 1. Cleavage Membrane: Installer's option of material that complies with ANSI A108.02, paragraph 3.8.
- 2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, **2 by 2 inches (50.8 by 50.8 mm)** by **0.062 inch (1.57 mm)** in diameter; comply with ASTM A1064/A1064M except for minimum wire size.
- 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self furring.
 - e. Weight: **[2.5 lb/sq. yd. (1.4 kg/sq. m)][3.4 lb/sq. yd. (1.8 kg/sq. m)]**.
- 4. Latex Additive: **[Manufacturer's standard][acrylic resin][or][styrene-butadiene-rubber]** water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**

- d. [C-Cure]
 - e. [Custom Building Products]
 - f. [Laticrete International, Inc.]
 - g. [MAPEI Corporation]
 - h. [Parex, a Sika brand]
 - i. [Siena Tile & Stone Installation Products; Omega Products International]
 - j. [Southern Grouts & Mortars, Inc]
 - k. [Summitville Tiles, Inc.]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [Laticrete International, Inc.]
 - g. [MAPEI Corporation]
 - h. [Parex, a Sika brand]
 - i. [Siena Tile & Stone Installation Products; Omega Products International]
 - j. [Southern Grouts & Mortars, Inc]
 - k. [Summitville Tiles, Inc.]
 - l. <Insert manufacturer's name>
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Siena Tile & Stone Installation Products; Omega Products International]
 - k. [Southern Grouts & Mortars, Inc]
 - l. [Summitville Tiles, Inc.]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. [ARDEX Americas]

- b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Siena Tile & Stone Installation Products; Omega Products International]
 - k. [Southern Grouts & Mortars, Inc]
 - l. [Summitville Tiles, Inc.]
 - m. <Insert manufacturer's name>
3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 4. Provide prepackaged, dry-mortar mix combined with [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.
 5. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

D. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Siena Tile & Stone Installation Products; Omega Products International]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Custom Building Products]
 - c. [H.B. Fuller Construction Products Inc. / TEC]
 - d. [Laticrete International, Inc.]
 - e. [MAPEI Corporation]
 - f. [Parex, a Sika brand]
 - g. [Siena Tile & Stone Installation Products; Omega Products International]
 - h. <Insert manufacturer's name>
3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
4. Provide prepackaged, dry-mortar mix combined with [acrylic resin][or][styrene-butadiene-rubber] liquid-latex additive at Project site.
5. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

E. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARDEX Americas]**
 - b. **[Atlas Minerals & Chemicals, Inc]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Southern Grouts & Mortars, Inc]**
 - j. **[Summitville Tiles, Inc.]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Atlas Minerals & Chemicals, Inc]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[Laticrete International, Inc.]**
 - g. **[MAPEI Corporation]**
 - h. **[Parex, a Sika brand]**
 - i. **[Southern Grouts & Mortars, Inc]**
 - j. **[Summitville Tiles, Inc.]**
 - k. **<Insert manufacturer's name>**
3. Adhesives shall have a VOC content of **[65]<Insert value>** g/L or less.
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

F. Organic Adhesive: ANSI A136.1, **[Type I][Type II]**.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ARDEX Americas]
 - b. [Bostik; Arkema]
 - c. [C-Cure]
 - d. [Custom Building Products]
 - e. [H.B. Fuller Construction Products Inc. / TEC]
 - f. [Laticrete International, Inc.]
 - g. [MAPEI Corporation]
 - h. [Parex, a Sika brand]
 - i. [Siena Tile & Stone Installation Products; Omega Products International]
 - j. [Southern Grouts & Mortars, Inc]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Bostik; Arkema]
 - c. [C-Cure]
 - d. [Custom Building Products]
 - e. [H.B. Fuller Construction Products Inc. / TEC]
 - f. [Laticrete International, Inc.]
 - g. [MAPEI Corporation]
 - h. [Parex, a Sika brand]
 - i. [Siena Tile & Stone Installation Products; Omega Products International]
 - j. [Southern Grouts & Mortars, Inc]
 - k. <Insert manufacturer's name>
3. Adhesives shall have a VOC content of [65]<Insert value> g/L or less.
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.14 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Sakrete; CRH Americas, Oldcastle APG]
 - k. [Siena Tile & Stone Installation Products; Omega Products International]
 - l. [Sika Corporation]
 - m. [Southern Grouts & Mortars, Inc]
 - n. [Summitville Tiles, Inc.]
 - o. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Sakrete; CRH Americas, Oldcastle APG]
 - k. [Siena Tile & Stone Installation Products; Omega Products International]
 - l. [Sika Corporation]
 - m. [Southern Grouts & Mortars, Inc]
 - n. [Summitville Tiles, Inc.]
 - o. <Insert manufacturer's name>
- C. High-Performance Tile Grout: ANSI A118.7.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Bostik; Arkema]
 - c. [Custom Building Products]
 - d. [H.B. Fuller Construction Products Inc. / TEC]
 - e. [Laticrete International, Inc.]
 - f. [MAPEI Corporation]
 - g. [Parex, a Sika brand]
 - h. [Southern Grouts & Mortars, Inc]
 - i. [Summitville Tiles, Inc.]
 - j. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. [ARDEX Americas]
- b. [Bostik; Arkema]
- c. [Custom Building Products]
- d. [H.B. Fuller Construction Products Inc. / TEC]
- e. [Laticrete International, Inc.]
- f. [MAPEI Corporation]
- g. [Parex, a Sika brand]
- h. [Southern Grouts & Mortars, Inc]
- i. [Summitville Tiles, Inc.]
- j. <Insert manufacturer's name>

3. Polymer Type:

- a. Dry, redispersible form, prepackaged with other dry ingredients.
- b. Liquid-latex form for addition to prepackaged dry-grout mix.

D. Water-Cleanable Epoxy Grout: ANSI A118.3[, with a VOC content of 65 g/L or less].

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Siena Tile & Stone Installation Products; Omega Products International]
- k. [Sika Corporation]
- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Siena Tile & Stone Installation Products; Omega Products International]
- k. [Sika Corporation]

- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

2.15 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayment and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, **4.0 mils (0.1 mm)** thick.
- C. Metal Flooring Transitions: Profile designed specifically for flooring applications, height to match stone tile and setting-bed thickness.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Blanke Corporation]
 - b. [Dural USA, Inc.]
 - c. [Profilitec Corp.]
 - d. [Progress Profiles America Inc.]
 - e. [Schluter Systems L.P.]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Blanke Corporation]
 - b. [Dural USA, Inc.]
 - c. [Profilitec Corp.]
 - d. [Progress Profiles America Inc.]
 - e. [Schluter Systems L.P.]
 - f. <Insert manufacturer's name>
 - 3. Description: **[L-shaped][Square]<Insert profile>**.
 - 4. Material and Finish: Metallic or combination of metal and PVC or neoprene base; **[chrome-plated brass][polished chrome anodized aluminum][polished nickel anodized aluminum][color-coated aluminum][half-hard brass][white zinc alloy]<Insert finish>** exposed-edge material.
 - a. Color: **[Brown][White][Gray]<Insert color>**.
- D. Metal Edge Trim: Profile designed for wall terminations and edge protection.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Blanke Corporation]
 - b. [Dural USA, Inc.]
 - c. [Profilitec Corp.]
 - d. [Progress Profiles America Inc.]

- e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Blanke Corporation]**
 - b. **[Dural USA, Inc.]**
 - c. **[Profilitec Corp.]**
 - d. **[Progress Profiles America Inc.]**
 - e. **[Schluter Systems L.P.]**
 - f. **<Insert manufacturer's name>**
3. Description: **[L-shaped][Square][Beveled]<Insert profile>**.
4. Terminations: **[End caps][Inside corners][Outside corners]** matching edge-protection profile.
5. Material and Finish: **[Chrome-plated brass][Polished chrome anodized aluminum][Polished nickel anodized aluminum][Color-coated aluminum]<Insert finish>** exposed-edge material.
- a. Color: **[Brown][White][Gray]<Insert color>**.
- E. Temporary Protective Coating: Formulated to protect exposed surfaces of stone tile against adherence of mortar and grout; compatible with stone, mortar, and grout products and easily removable after grouting is completed without damaging grout or stone tile.
- F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming stone tile and grout surfaces, specifically approved for materials and installations indicated by stone tile producers and grout manufacturers.
- G. Grout Sealer: Grout manufacturer's standard product for stone type and application indicated that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where stone tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- 1. Verify that substrates for setting stone tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for stone tile floors installed with **[adhesives][bonded mortar bed][or][thinset mortar]** comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind stone tile has been completed.

4. Verify that joints and cracks in stone tile substrates are coordinated with stone tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for stone tile floors installed with **[adhesives][or][thinset mortar]** with trowelable patching compound specifically recommended by tile-setting material manufacturer.
- C. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot (1:50)** toward drains.
- D. Lay out stone tile patterns by marking joint lines on substrates to verify joint placement at edges, corners, doors, and other critical elements.
 1. Notify Architect seven days in advance of dates and times when layout will be done.
 2. Obtain Architect's approval of layout before starting stone tile installation.
- E. Lay out stone tiles on substrates or on an adjacent surface to establish placement of individual stone tiles for balance of color and pattern variations.
 1. Notify Architect seven days in advance of dates and times when layout will be done.
 2. Architect may relocate specific stone tiles with other stone tiles of same type and will determine final location of each stone tile within indicated patterns.
 3. Identify each stone tile with a temporary number marked on face of stone tile that corresponds with an identical number marked on a layout drawing, and obtain Architect's approval before starting stone tile installation.
- F. Substrate Flatness:
 1. For stone tile shorter than **15 inches (0.38 m)**, confirm that structure or substrate is limited to variation of **1/4 inch in 10 ft. (6 mm in 3 m)** from the required plane, and no more than **1/6 inch in 12 inches (2 mm in 305 mm)** when measured from tile surface high points.
 2. For stone tile with at least one edge **15 inches (0.38 m)** or longer, confirm that structure or substrate is limited to **1/8 inch in 10 ft. (3 mm in 3 m)** from the required plane, and no more than **1/6 inch in 24 inches (2 mm in 0.6 m)** when measured from tile surface high points.
- G. Field-Applied Temporary Protective Coating: If indicated under stone tile type or needed to prevent grout from staining or adhering to exposed stone tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed stone tile surfaces.

3.3 INSTALLATION OF STONE TILE SYSTEM

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Mix mortars and grouts to comply with "Referenced Standards" Article in the Evaluations and mortar and grout manufacturers' written instructions.
 1. Add materials, water, and additives in accurate proportions.
 2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
- E. Install stone tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in stone tile installation schedules. Comply with parts of the ANSI A108 series that are referenced in TCNA installation methods specified in stone tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior stone tile floors and walls.
 - b. Stone tile floors in wet areas.
 - c. Stone tile floors consisting of stone tiles **8 by 8 inches (200 by 200 mm)** or larger.
 2. Wipe backs of stone tiles with a damp cloth to remove dirt and dust before units are installed.
 3. Extend stone tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 4. Accurately form intersections and returns. Perform cutting and drilling of stone tile without marring visible surfaces. Carefully grind cut edges of stone tile abutting trim, finish, or built-in items for straight aligned joints. Fit stone tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap stone tile.
 5. Finish cut stone tile edges that will not be concealed by other construction by grinding and honing cut surfaces **[and beveling edges][and easing edges]** to match factory-fabricated edges **[unless otherwise indicated]**.
 6. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 7. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 8. Jointing Pattern: Lay stone tile in grid pattern unless otherwise indicated. Lay out stone tile work and center stone tile fields in both directions in each space or on each wall area. Lay out stone tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. Where adjoining stone tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - b. Where stone tiles are specified or indicated to be whole integer multiples of adjoining stone tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 9. Lay out stone tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
 10. Match stone tiles within each space by selecting tiles to achieve uniformity of color and pattern.

- Reject or relocate stone tiles that do not match color and pattern of adjacent tiles.
 11. Mix stone tiles to achieve a uniformly random distribution of color shadings and patterns.
 12. Pattern Orientation: For stone varieties with directional pattern, orient pattern as **[indicated on Drawings][directed by Architect]**.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and stone tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing stone tiles.
1. Where joints occur in concrete substrates, locate joints in stone tile surfaces directly above them.
- G. Thresholds: Install stone and solid surface thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in **[modified dry-set][improved modified dry-set]** mortar (thinset).
 2. Do not extend **[cleavage membrane][waterproof membrane][or][crack isolation membrane]** under thresholds set in **[standard dry-set][modified dry-set][improved modified dry-set]** mortar. Fill joints between such thresholds and adjoining stone tile with elastomeric sealant.
- H. Metal Flooring Transitions: Install **[at locations indicated][where exposed edge of stone tile flooring meets carpet, wood, or other flooring that finishes flush with top of stone tile][where exposed edge of stone tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of stone tile and no threshold is indicated]**.
- I. Metal Wall Trim: Install at locations indicated on Drawings.
- J. Grout Sealer: Apply grout sealer to **[cementitious]** grout joints **[in tile floors]** in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- 3.4 FIELD QUALITY CONTROL
- A. Water Test:
1. Test of waterproofing membrane in showers and similar areas to be performed by Installation Contractor before setting tile.
 - a. Perform test after 24 hours of waterproof membrane installation.
 - b. Insert test plug in drain or waste line.
 - c. Fill shower base with water, high enough that the membrane-to-drain connection and floor-to-wall transition can be evaluated, and mark wall.
 - d. Check for leaks after 24 hours.
 2. Test to be witnessed by **[Architect][authorities having jurisdiction]<Insert names or titles of witnesses>**.
- B. Nonconforming Work:
1. Waterproof membrane will be considered defective if water level has dropped.
 2. Remove and replace defective components and retest.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining stone tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean stone tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from stone tile as soon as possible.
 - 2. Clean grout smears and haze from stone tile in accordance with stone tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by stone tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of stone tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

- A. Protect installed stone tile floors with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by stone tile manufacturer, apply coat of neutral protective cleaner to completed stone tile walls and floors.
- B. Prohibit foot and wheel traffic from stone tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from stone tile surfaces.

3.7 EXTERIOR STONE TILE INSTALLATION SCHEDULE

- A. Exterior Floor Installations:
 - 1. TCNA F101 STONE <Insert designation>: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]**. Cement mortar bed (thickset) **[bonded to concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and bonded to concrete where membrane is not indicated]**.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement]** grout.
 - 1) Color: White.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch**

- f. Movement Joints: Types located on Drawings.
2. TCNA F102 STONE <Insert designation>: Thinset mortar [on concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated][over crack isolation membrane on concrete][over crack isolation membrane on concrete where indicated and on concrete where membrane is not indicated].
- a. Stone Tile Type: <Insert stone-tile-type designation>.
- b. Thinset Mortar: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
- 1) Color: White.
- c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement] grout.
- d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- e. Crack Isolation Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- f. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
- g. Movement Joints: Types located on Drawings.
- B. Exterior Roof/Deck Floor Installations:
1. TCNA F103 STONE <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) [over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated] over drainage material on roof membrane.
- a. Stone Tile Type: <Insert stone-tile-type designation>.
- b. Bond Coat for Cured-Bed Method: [Modified dry-set][Improved modified dry-set] mortar.
- 1) Color: White.
- c. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement] grout.
- d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- e. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
- f. Movement Joints: Types located on Drawings.
2. TCNA F104 STONE <Insert designation>: Thinset mortar [on concrete][over waterproof membrane on concrete][over waterproof membrane on concrete where indicated and on concrete where membrane is not indicated][over crack isolation membrane on concrete][over crack isolation membrane on concrete where indicated and on concrete where membrane is not indicated].
- a. Stone Tile Type: <Insert stone-tile-type designation>.
- b. Thinset Mortar: [Modified dry-set][Improved modified dry-set] mortar.

- 1) Color: White.
- c. Grout: **[Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement]** grout.
- d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
- e. Crack Isolation Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
- f. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
- g. Movement Joints: Types located on Drawings.

C. Exterior Wall Installations, Masonry or Concrete:

1. TCNA W201 STONE <Insert designation>: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]**. Cement mortar bed (thickset) on metal lath **[over waterproof membrane][over water-resistant barrier][over vapor-retarder membrane]**.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Water-Resistive Barrier: Compliant with local code requirements **[and][specified in Division 07]**.
 - f. Vapor Retarder: Compliant with local code requirements **[and][specified in Division 07]**.
 - g. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - h. Movement Joints: Types located on Drawings.
2. TCNA W202E STONE <Insert designation>: Thinset mortar **[over waterproof membrane][over water-resistive barrier][over vapor retarder membrane]**.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Thinset Mortar: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Water-Resistive Barrier: Compliant with local code requirements **[and][specified in Division 07]**.

- f. Vapor Retarder: Compliant with local code requirements **[and][specified in Division 07]**.
- g. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
- h. Movement Joints: Types located on Drawings.

D. Exterior Wall Installations, Wood or Metal Studs:

1. TCNA W244E STONE **<Insert designation>**: Thinset mortar **[over waterproof membrane on cementitious backer units][on cementitious backer units over vapor-retarder membrane][on cementitious backer units over water-resistive barrier]**.
 - a. Stone Tile Type: **<Insert stone-tile-type designation>**.
 - b. Thinset Mortar: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Water-Resistive Barrier: Compliant with local code requirements **[and][specified in Division 07]**.
 - f. Vapor Retarder: Compliant with local code requirements **[and][specified in Division 07]**.
 - g. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - h. Movement Joints: Types located on Drawings.

3.8 INTERIOR STONE TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. TCNA F111 STONE **<Insert designation>**: Method **[ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]**. Cement mortar bed (thickset) with cleavage membrane.
 - a. Stone Tile Type: **<Insert stone-tile-type designation>**.
 - b. Bond Coat for Cured-Bed Method: **[Dry-set][Modified dry-set mortar][Improved modified dry-set mortar][Water-cleanable, tile-setting epoxy]**.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded]** grout.
 - d. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - e. Movement Joints: Types located on Drawings.
2. TCNA F125-Full STONE **<Insert designation>**: Thinset mortar on crack isolation membrane.
 - a. Stone Tile Type: **<Insert stone-tile-type designation>**.
 - b. Thinset Mortar: **[Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Standard sanded cement][Standard unsanded cement][High-performance**

- d. **sanded**[High-performance unsanded][Water-cleanable epoxy] grout.
Crack Isolation Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- e. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
- f. Movement Joints: Types located on Drawings.

B. Interior Floor Installations, Wood Subfloor:

1. TCNA F141 STONE <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) over cleavage membrane[over waterproof membrane].
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Modified dry-set mortar][Improved modified dry-set mortar][Water-cleanable, tile-setting epoxy].
 - 1) Color: White.
 - c. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
 - f. Movement Joints: Types located on Drawings.

C. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I STONE <Insert designation>: Thinset mortar[over waterproof membrane].
 - a. Stone Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [Dry-set][Modified dry-set][Improved modified dry-set][Water-cleanable epoxy] mortar.
 - 1) Color: White.
 - c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>.
 - f. Movement Joints: Types located on Drawings.
2. TCNA W211 STONE <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) bonded to substrate[over waterproof membrane].
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Modified dry-set mortar][Improved modified dry-set mortar][Water-cleanable, tile-setting epoxy].

- 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - f. Movement Joints: Types located on Drawings.
- D. Interior Wall Installations, Wood or Metal Studs or Furring:
1. TCNA W243 STONE <Insert designation>: **[Thinset mortar][Water-cleanable, tile-setting epoxy]** on gypsum board.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Thinset Mortar: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
 - d. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - e. Movement Joints: Types located on Drawings.
 2. TCNA W245 STONE <Insert designation>: **[Thinset mortar][Water-cleanable, tile-setting epoxy]** on glass-mat, water-resistant gypsum backer board **[over waterproof membrane]**.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Thinset Mortar: **[Dry-set][Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - f. Movement Joints: Types located on Drawings.
- E. Bathtub Wall Installations with No Shower Head, Wood or Metal Studs, or Furring:
1. TCNA B413 STONE <Insert designation>: **[Thinset mortar][Water-cleanable, tile-setting epoxy]** on **[water-resistant gypsum board][coated glass-mat, water-resistant gypsum board]**.
 - a. Stone Tile Type: <Insert stone-tile-type designation>.
 - b. Thinset Mortar: **[Standard dry-set][Modified dry-set][Improved modified dry-set]** mortar.

- 1) Color: White.
- c. Grout: **[Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
- d. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
- e. Movement Joints: Types located on Drawings.

F. Bathtub/Shower Wall Installations:

1. TCNA B419 STONE **<Insert designation>**: **[Thinset mortar][Water-cleanable, tile-setting epoxy][over waterproof membrane]** on coated glass-mat, water-resistant gypsum backer board.
 - a. Stone Tile Type: **<Insert stone-tile-type designation>**.
 - b. Thinset Mortar: **[Modified dry-set][Improved modified dry-set]** mortar.
 - 1) Color: White.
 - c. Grout: **[Standard sanded cement][Standard unsanded cement][High-performance sanded][High-performance unsanded][Water-cleanable epoxy]** grout.
 - d. Waterproof Membrane: **[As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane]**.
 - e. Joint Width: **[1/8 inch (3.2 mm)][3/16 inch (4.76 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert width>**.
 - f. Movement Joints: Types located on Drawings.

END OF SECTION 09 30 33 00



Task	Specification	Specification Description
09 34 00 00	09 30 13 00	Ceramic Tiling
09 39 00 00	09 30 13 00	Ceramic Tiling



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SECTION 09 51 13 00 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Exposed metal suspension system.
3. Metal edge moldings and trim.

B. Related Requirements:

1. Section 095123 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with fully concealed suspension systems, stapling, or adhesive bonding.
2. Section 095133 "Acoustical Metal Pan Ceilings" for ceilings consisting of metal-pan units with exposed and concealed suspension systems.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference [at **Project site**][by web conference]<Insert location> .

1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

B. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of [full-size][6-inch- (150-mm-) square]<Insert size> Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of [6-inch- (150-mm-)]<Insert dimension> long Samples of each type, finish, and color.
3. Clips: Full-size [hold-down][impact][and][seismic] clips.

E. Delegated Design Submittals: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer

- recycled content and cost.
3. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
4. Environmental Product Declaration (EPD): For each product.
5. Health Product Declaration (HPD): For each product.
6. Environmental Product Declaration (EPD): For each product.
7. Health Product Declaration (HPD): For each product.
8. Environmental Product Declaration (EPD): For each product.
9. Environmental Product Declaration (EPD): For each product.
10. Environmental Product Declaration (EPD): For each product.
11. Third-Party Certifications: For each product.
12. Third-Party-Certified Life-Cycle Assessment: For each product.
13. Health Product Declaration (HPD): For each product.
14. Health Product Declaration (HPD): Provide HPD.
15. Health Product Declaration (HPD): Provide documentation confirming product compliance with one of the following:
 - a. Inventory or HPD to at least 0.01 percent by weight, with at least 95 percent assessed using GreenScreen Benchmark assessment.
 - b. Cradle to Cradle v3 certification with minimum Silver level of Material Health.
 - c. Living Product Challenge certification indicating achievement of Imperative 09, "Transparent Material Health."
16. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.
17. Laboratory Test Reports: For ceiling products, indicating compliance with the VOC emissions evaluation.
18. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Ceiling suspension-system members.
 2. Structural members to which suspension systems will be attached.
 3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 5. Size and location of initial access modules for acoustical panels.
 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.

- g. Perimeter moldings.
 - 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 - 8. Minimum Drawing Scale: [1/4 inch = 1 ft. (1:48)][1/8 inch = 1 ft. (1:96)][1:50][1:100]<Insert scale> .
 - B. Product Test Reports: For each acoustical panel ceiling, for tests performed by [manufacturer and witnessed by a qualified testing agency][a qualified testing agency] .
 - C. Evaluation Reports: For each acoustical panel ceiling suspension system [and anchor and fastener type] , from ICC-ES.
 - D. Field Quality Control Reports: For specified tests and inspections.
 - E. Qualification Statements: For testing agency.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in maintenance manuals.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials [, from the same production run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Panels: Full-size panels equal to [2]<Insert number> percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to [2]<Insert number> percent of quantity installed.
 - 3. Hold-Down Clips: Equal to [2]<Insert number> percent of quantity installed.
 - 4. Impact Clips: Equal to [2]<Insert number> percent of quantity installed.
- 1.7 MOCKUPS
- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as indicated on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Source Limitations for Ceiling System: Obtain each type of acoustical panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>** .
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class **[A][B][C]** in accordance with ASTM E1264.
 - 2. Smoke-Developed Index: **[50][450]<Insert value>** or less.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL or from the listings of another qualified testing agency.
- E. Verify ceiling products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Verify ceiling products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

2.3 ACOUSTICAL PANEL CEILINGS

- A. Acoustical Panels : Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [American Gypsum]
 - b. [Armstrong World Industries]
 - c. [Cardinal Acoustics, Inc.]
 - d. [CertainTeed; SAINT-GOBAIN]
 - e. [Rockfon; ROCKWOOL International]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Gypsum]
 - b. [Armstrong World Industries]
 - c. [Cardinal Acoustics, Inc.]
 - d. [CertainTeed; SAINT-GOBAIN]
 - e. [Rockfon; ROCKWOOL International]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
4. Classification: Provide [fire-resistance-rated] panels as follows:
 - a. Type and Form, Type III: Mineral base with painted finish; [Form 1, nodular][Form 2, water felted][Form 4, cast or molded] .
 - b. Type and Form, Type IV Form 1: Mineral base with membrane-faced overlay; Form 1, nodular; with [glass-fiber cloth][washable vinyl-film] overlay.
 - c. Type and Form, Type IV Form 2: Mineral base with membrane-faced overlay; Form 2, water felted; with [vinyl overlay on face][vinyl overlay on face and back][vinyl overlay on face, back, and sealed edges][fiberglass-fabric overlay on face] .
 - d. Type and Form, Type XII: Glass-fiber base with membrane-faced overlay; [Form 1, plastic][Form 2, cloth][Form 3, other] . Binder may not contain urea formaldehyde.
 - e. Type and Form, Type XX: High-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
 - f. Type and Form: <Insert type and form> .
 - g. Pattern: [C (perforated, small holes)][CD (perforated, small holes and fissured)][CE (perforated, small holes and lightly textured)][D (fissured)][E (lightly textured)][F (heavily textured)][G (smooth)][GH (smooth and printed)][I (embossed)][J (embossed-in-register)][K (surface scored)][Z (other patterns as described)][and][as indicated by manufacturer's designation]<Insert pattern> .
5. Color: [White][As selected from manufacturer's full range][Match Architect's sample][As indicated by manufacturer's designation][As indicated on Drawings][As indicated in a schedule]<Insert color> .
6. Light Reflectance (LR): Not less than [LR indicated in a schedule][0.65][0.70][0.75][0.80][0.85][0.90]<Insert LR> .
7. Ceiling Attenuation Class (CAC): Not less than [CAC indicated in a schedule][20][25][30][35][40]<Insert CAC> .
8. Noise Reduction Coefficient (NRC): Not less than [NRC indicated in a schedule][0.40][0.50][0.55][0.60][0.65][0.70][0.75][0.80][0.85][0.90][0.95][1.00]<Insert NRC> .

9. Articulation Class (AC): Not less than **[AC indicated in a schedule][170][180][190][200][210]<Insert AC>** .
10. Edge/Joint Detail: **[Square][Reveal sized to fit flange of exposed suspension-system members][Flush reveal sized to fit flange of exposed suspension-system members][Beveled, kerfed, and rabbeted long edges and square, butt-on short edges][As indicated by manufacturer's designation]<Insert requirement>** .
11. Thickness: **[5/8 inch (15 mm)][3/4 inch (19 mm)][7/8 inch (22 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][As indicated on Drawings][As indicated in a schedule]<Insert dimension>** .
12. Modular Size: **[24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][24 by 72 inches (610 by 1830 mm)][24 by 96 inches (610 by 2440 mm)][48 by 48 inches (1220 by 1220 mm)][600 by 600 mm][600 by 1200 mm][As indicated on Drawings][As indicated in a schedule]<Insert size>** .
13. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

B. Exposed Metal Suspension System :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Armstrong World Industries]**
 - b. **[Cardinal Acoustics, Inc.]**
 - c. **[CertainTeed; SAINT-GOBAIN]**
 - d. **[Cipriani USA]**
 - e. **[Rockfon; ROCKWOOL International]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong World Industries]**
 - b. **[Cardinal Acoustics, Inc.]**
 - c. **[CertainTeed; SAINT-GOBAIN]**
 - d. **[Cipriani USA]**
 - e. **[Rockfon; ROCKWOOL International]**
 - f. **[USG Corporation]**
 - g. **<Insert manufacturer's name>**
3. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - a. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.
4. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation; with prefinished **15/16-inch- (24-mm-)** wide metal caps on flanges.

- a. Fire Rating: **[As indicated on Drawings]<Insert fire rating> .**
 - b. Structural Classification: **[Intermediate][Heavy] -duty system.**
 - c. End Condition of Cross Runners: **[Override (stepped)][or][butt-edge] type.**
 - d. Face Design: Flat, flush.
 - e. Cap Material: **[Cold-rolled steel][or][aluminum] .**
 - f. Cap Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum] .**
5. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation; with prefinished **9/16-inch- (15-mm-)** wide metal caps on flanges.
- a. Structural Classification: **[Intermediate][Heavy] -duty system.**
 - b. End Condition of Cross Runners: **[Override (stepped)][or][butt-edge] type.**
 - c. Face Design: **[Flat, flush][Flanges formed with an integral center reveal] .**
 - d. Cap Material: **[Cold-rolled steel][or][aluminum] .**
 - e. Cap Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum] .**
6. Narrow-Face, Steel-Capped, Double-Web, Fire-Rated Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation; with prefinished, cold-rolled, **9/16-inch- (15-mm-)** wide metal caps on flanges.
- a. Structural Classification: Intermediate-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation] .**
7. Narrow-Face, Uncapped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation; to produce structural members with **9/16-inch- (15-mm-)** wide faces.
- a. Structural Classification: **[Intermediate][Heavy] -duty system.**
 - b. Face Design: **[With 1/8-inch- (3-mm-) wide, slotted, box-shaped flange][With 1/4-inch- (6-mm-) wide, slotted, box-shaped flange][Flanges formed in stepped design with a center protrusion projecting 19/64 inch (7.54 mm) below flange surfaces supporting panel faces and forming 3/16-inch- (4.76-mm-) wide reveals between edges of protrusion and those of panels] .**
 - c. Face Finish: Painted **[white][in color as selected from manufacturer's full range][to match color indicated by manufacturer's designation][to match color of acoustical unit] .**
 - d. Reveal Finish: Painted **[to match flange color][white][black][in color other than flange color as selected from manufacturer's full range of contrasting reveal colors] .**
8. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension

System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, **G60 (Z180)** coating designation; with prefinished, **15/16-inch- (24-mm-)** wide aluminum caps on flanges.

- a. Fire Rating: **[As indicated on the Drawings]<Insert fire rating>** .
- b. Structural Classification: **[Intermediate][Heavy]** -duty system.
- c. Face Design: Flat, flush.
- d. Cap Finish: **[Painted white][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Natural finish]** .

9. Wide-Face, Single-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet electrolytically zinc coated, with prefinished flanges of width indicated.

- a. Structural Classification: Heavy-duty system.
- b. Face Finish: Painted **[white][black]** .

10. Wide-Face, Capped, Double-Web, Stainless Steel Suspension System: Main and cross runners roll formed from Type 304 or 316 stainless steel sheet, with prefinished **15/16-inch- (24-mm-)** wide, stainless steel caps on flanges.

- a. Structural Classification: Intermediate-duty system.
- b. Face Design: Flat, flush.

11. Narrow-Face, Single-Web, Extruded-Aluminum Suspension System: Main and cross runners formed from extruded aluminum to produce structural members with **9/16-inch- (15-mm-)** wide faces.

- a. Structural Classification: **[Intermediate][Heavy]** -duty system.
- b. Face Design: Screw-slot profile.
- c. Face Finish: **[Painted white][Satin anodized in accordance with AAMA 611, AA-M12C22A31]** .
- d. Reveal Finish: **[Match face finish][Painted white][Painted black]** .

12. Extra-Wide-Face, Metal Suspension System: Main and cross runners formed from **[extruded aluminum][aluminum-capped steel][steel-capped steel]<Insert description>** to produce structural members with **[1-1/2-inch- (38-mm-)][2-inch- (50-mm-)]** wide flanges.

- a. Structural Classification: **[Intermediate][Heavy]** -duty system.
- b. Face Design: Flat, flush.
- c. Face Finish: **[Painted white][Satin anodized in accordance with AAMA 611, AA-M12C22A31]** .
- d. Gasket System: Clean-room type.

C. Metal Edge Moldings and Trim :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Armstrong World Industries]**
- b. **[CertainTeed; SAINT-GOBAIN]**
- c. **[Cipriani USA]**
- d. **[Rockfon; ROCKWOOL International]**
- e. **[USG Corporation]**

- f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Armstrong World Industries]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Cipriani USA]
 - d. [Rockfon; ROCKWOOL International]
 - e. [USG Corporation]
 - f. <Insert manufacturer's name>
3. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - a. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - b. For lay-in panels with reveal edge details, provide **[stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member]<Insert description>**.
 - c. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
4. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
5. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
6. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.4 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. [**Comply with seismic design requirements.**]
 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[five]<Insert safety factor>** times that imposed by ceiling construction, as determined by testing in accordance with ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: **[Cast-in-place][Postinstalled expansion][Postinstalled bonded]** anchors.
 - b. Corrosion Protection, Carbon Steel: Components zinc plated in accordance with ASTM B633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection, Stainless Steel: Components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
 - d. Corrosion Protection, Nickel-Copper Alloy: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application

indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[10]<Insert safety factor>** times that imposed by ceiling construction, as determined by testing in accordance with ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than **[0.106-inch- (2.69-mm-)] [0.135-inch- (3.5-mm-)] <Insert dimension>** diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than **7/8 inch (22 mm)** wide; formed with **0.04-inch- (1-mm-)** thick, galvanized-steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation; with bolted connections and **5/16-inch- (8-mm-)** diameter bolts.

F. Hold-Down Clips: Manufacturer's standard hold-down.

G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

I. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

J. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

K. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including **[manufacturer's standard][closed-cell PVC][neoprene][antimicrobial]** gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.5 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation

tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

- A. Install acoustical panel ceilings in accordance with ASTM C636/C636M [, **seismic design requirements,**] and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems in accordance with tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required [**and, if permitted with fire-resistance-rated ceilings,**] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Metal Edge Moldings and Trim: Install edge moldings and trim of type indicated at perimeter of acoustical panel ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to **[long][short]** axis of space.
 - c. Install panels in a basket-weave pattern.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - 5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 6. Install **[hold-down][impact][and][seismic]** clips in areas indicated; space in accordance with panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space **[24 inches (610 mm)]<Insert dimension>** o.c. on all cross runners.
 - 7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 - 8. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of **[1/8 inch in 12 ft. (3 mm in 3.6 m)]<Insert dimensions>**, non-cumulative.
- B. Metal Edge Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of **[1/8 inch in 12 ft. (3 mm in 3.6 m)]<Insert dimensions>**, non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage][Engage]** a qualified special inspector to perform the following special inspections:
 - 1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for **200 lbf (890 N)** of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for **440 bf (1957 N)** of tension.
 - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
 - 3. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13 00



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SECTION 09 51 23 00 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles.
2. Metal suspension system.
3. Metal edge moldings and trim.

B. Related Requirements:

1. Section 095113 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
2. Section 095133 "Acoustical Metal Pan Ceilings" for ceilings consisting of metal-pan units with exposed and concealed suspension systems.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
3. Environmental Product Declaration (EPD): For each product.
4. Health Product Declaration (HPD): For each product.
5. Environmental Product Declaration (EPD): For each product.
6. Health Product Declaration (HPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Environmental Product Declaration (EPD): For each product.
9. Environmental Product Declaration (EPD): For each product.
10. Third-Party Certifications: For each product.
11. Third-Party-Certified Life-Cycle Assessment: For each product.
12. Health Product Declaration (HPD): For each product.
13. Health Product Declaration (HPD): Provide HPD.
14. Health Product Declaration (HPD): Provide documentation confirming product compliance with

one of the following:

- a. Inventory or HPD to at least 0.01 percent by weight, with at least 95 percent assessed using GreenScreen Benchmark assessment.
- b. Cradle to Cradle v3 certification with minimum Silver level of Material Health.
- c. Living Product Challenge certification indicating achievement of Imperative 09, "Transparent Material Health."

15. Health Product Declaration (HPD): Provide documentation indicating that manufacturer has screened and publicly provided ingredient disclosure to 1000 ppm, and has developed an action plan to mitigate known hazards.
16. Product Data: For adhesives, indicating VOC content.
17. Laboratory Test Reports: For ceiling products, indicating compliance with the VOC emissions evaluation.
18. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** in size.

D. Samples for Initial Selection: For components with factory-applied finishes.

E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: **[6-inch- (150-mm-)]<Insert dimension>** long Sample of each type.
3. Exposed Moldings and Trim: Set of **[6-inch- (150-mm-)]<Insert dimension>** long Samples of each type and color.
4. Seismic Clips: Full size.

F. Delegated Design Submittals: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical tile.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

- a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 - h. <Insert item>.
 - 7. Show operation of hinged and sliding components adjacent to acoustical tiles.
 - 8. Minimum Drawing Scale: [1/4 inch = 1 foot (1:48)][1/8 inch = 1 foot (1:96)][1:50][1:100]<Insert scale>.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical tile ceiling, for tests performed by [manufacturer and witnessed by a qualified testing agency][a qualified testing agency].
- D. Evaluation Reports: For each acoustical tile ceiling suspension system[and anchor and fastener type], from ICC-ES.
- E. Field quality-control reports.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in maintenance manuals.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials[, from the same production run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- 1. Acoustical Ceiling Units: Full-size tiles equal to [2]<Insert number> percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to [2]<Insert number> percent of quantity installed.
- 1.7 QUALITY ASSURANCE
- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
- 1. Build mockup of typical ceiling area as indicated on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture,

humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Suspended Acoustical Tile Ceiling System: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.
- B. Source Limitations for Directly Attached Acoustical Tile Ceiling Tile: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Verify ceiling products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Verify ceiling products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- D. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]**<Insert requirement>.
- E. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class **[A][B][C]** in accordance with ASTM E1264.
 - 2. Smoke-Developed Index: **[50][450]**<Insert value> or less.
- F. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL TILES

A. Acoustical Tiles :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Armstrong World Industries, Inc]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong World Industries, Inc]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
3. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
5. Classification: Provide **[fire-resistance-rated]** tiles as follows:
 - a. Type and Form, Type III: Mineral base with painted finish; **[Form 1, nodular][Form 2, water felted][Form 4, cast or molded]**.
 - b. Type and Form: **<Insert type and form>**.
 - c. Pattern: **[C (perforated, small holes)][CD (perforated, small holes and fissured)][CE (perforated, small holes and lightly textured)][D (fissured)][E (lightly textured)][F (heavily textured)][G (smooth)][I (embossed)][J (embossed-in-register)][and][as indicated by manufacturer's designation]<Insert pattern>**.
6. Color: **[White][As selected from manufacturer's full range][Match Architect's sample][As indicated by manufacturer's designation][As indicated on Drawings][As indicated in a schedule]<Insert color>**.
7. Light Reflectance (LR): Not less than **[LR indicated in a schedule][0.65][0.70][0.75][0.80]<Insert LR>**.
8. Ceiling Attenuation Class (CAC): Not less than **[CAC indicated in a schedule][20][25][30][35][40]<Insert CAC>**.
9. Noise Reduction Coefficient (NRC): Not less than **[NRC indicated in a schedule][0.50][0.55][0.60][0.65][0.70]<Insert NRC>**.
10. Articulation Class (AC): Not less than **[AC indicated in a schedule][170][180][190][200][210]<Insert AC>**.
11. Edge/Joint Detail: **[Square, kerfed, and rabbeted; tongue and grooved; or butt][Beveled, kerfed, and rabbeted; tongue and grooved; or butt][Beveled, kerfed, and rabbeted long**

edges and square, butt on short edges][As indicated by manufacturer's designation]<Insert requirement>.

12. Thickness: **[5/8 inch (15 mm)][3/4 inch (19 mm)][As indicated on Drawings][As indicated in a schedule]<Insert thickness>.**
13. Modular Size: **[12 by 12 inches (305 by 305 mm)][300 by 300 mm][As indicated on Drawings][As indicated in a schedule]<Insert size>.**
14. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEM

A. Concealed or Semi-Exposed Metal Suspension System :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
3. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, fully concealed, metal suspension system and accessories of type, structural classification, and finish indicated that complies with applicable requirements in ASTM C635/C635M.
 - a. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.
4. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation.
 - a. Fire Rating: **[As indicated on Drawings]<Insert fire rating>.**
 - b. Structural Classification: **[Intermediate][Heavy]-duty system.**
 - c. Access: **[Upward][Downward]** and **[end pivoted][or][side pivoted]**, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

- 1) Initial Access Opening: In each module, **[24 by 24 inches (610 by 610 mm)]****[As indicated on Drawings]**<Insert requirements>.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[five]**<Insert safety factor> times that imposed by ceiling construction, as determined by testing in accordance with ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: **[Cast-in-place]****[Postinstalled expansion]****[Postinstalled bonded]** anchors.
 - b. Corrosion Protection, Carbon Steel: Components zinc plated in accordance with ASTM B633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection, Stainless Steel: Components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **[10]**<Insert safety factor> times that imposed by ceiling construction, as determined by testing in accordance with ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
 3. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than **[0.106-inch- (2.69-mm-)]****[0.135-inch- (3.5-mm-)]**<Insert dimension> diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than **7/8 inch (22 mm)** wide; formed with **0.04-inch- (1-mm-)** thick, galvanized-steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation; with bolted connections and **5/16-inch- (8-mm-)** diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical tiles in-place during a seismic event.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Metal Edge Moldings and Trim :



1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[CertainTeed; SAINT-GOBAIN]**
 - c. **[Rockfon; ROCKWOOL International]**
 - d. **[USG Corporation]**
 - e. **<Insert manufacturer's name>**
3. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.
 - a. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - b. For lay-in panels with reveal edge details, provide **[stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member]<Insert description>**.
 - c. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 - d. Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit]<Insert finish>**.
4. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
 - a. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 - b. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

2.8 MISCELLANEOUS MATERIALS

- A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.
 - 1. Verify adhesives have a VOC content of **[50]<Insert number>** g/L or less.
- B. Staples: **5/16-inch- (8-mm-)** long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- C. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings in accordance with ASTM C636/C636M[, **seismic design requirements,**] and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems in accordance with tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required[**and, if permitted with fire-resistance-rated ceilings,**] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or

- equivalent devices.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange directionally patterned acoustical tiles as follows:
1. As indicated on reflected ceiling plans.
 2. Install tiles with pattern running in one direction parallel to **[long][short]** axis of space.
 3. Install tiles in a basket-weave pattern.
- G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.
1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
 2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced **12 inches (305 mm)** o.c.
 3. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.

3.4 INSTALLATION OF DIRECTLY ATTACHED ACOUSTICAL TILE CEILINGS

- A. Adhesive Installation: Install acoustical tile by bonding to substrate, using acoustical tile adhesive and procedure recommended in writing by tile manufacturer and as follows:
 - 1. Wipe and prime ceiling.
 - 2. Remove loose dust from backs of tiles by brushing.
 - 3. Install splines in joints between tiles and maintain bottom surface to a uniform level. Shim tile or correct substrate as required to maintain levelness.
 - 4. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.
- B. Stapled Installation: Fasten acoustical tile to substrate using a minimum of two staples per tile that are installed in flanges of tile and as follows:
 - 1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
 - 2. Maintain bottom surface of tiles to a uniform level. Shim tile or correct substrate as required to maintain levelness.
 - 3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
- D. Arrange directionally patterned acoustical tiles **[as indicated on Drawings][with pattern running in one direction parallel to long axis of space][with pattern running in one direction parallel to short axis of space][in a basket-weave pattern]<Insert requirement>**.

3.5 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of **[1/8 inch in 12 feet (3 mm in 3.6 m)]<Insert dimensions>**, non-cumulative.
- B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of **[1/8 inch in 12 feet (3 mm in 3.6 m) and not exceeding 1/4 inch (6 mm) cumulatively]<Insert requirement>**.
- C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of **[1/8 inch in 12 feet (3 mm in 3.6 m)]<Insert dimensions>**, non-cumulative.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage][Engage]** a qualified special inspector to perform the following special inspections:
 - 1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed

installations of acoustical tile ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for **200 lbf (890 N)** of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for **440 lbf (1957 N)** of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

- D. Acoustical tile ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 23 00

SECTION 09 51 33 00 - ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum pans for acoustical metal pan ceiling.
2. Steel pans for acoustical metal pan ceiling.
3. Stainless steel pans for acoustical metal pan ceiling.
4. Metal suspension system for acoustical, standard-grid metal pan ceilings.
5. Metal suspension system for acoustical, snap-in metal pan ceilings.

B. Related Requirements:

1. Section 079219 "Acoustical Joint Sealants" for acoustical sealant for exposed and concealed joints.
2. Section 095113 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
3. Section 095123 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
4. Section 095423 "Linear Metal Ceilings."
5. Section 095436 "Suspended Decorative Grids."
6. Section 095753 "Security Ceiling Assemblies" for downward-locking panel and plank ceilings for use in security or detention facilities.

C. Products furnished, but not installed, under this Section include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include procedure for cutting metal pans.

1. Aluminum pans for acoustical metal pan ceiling.
2. Steel pans for acoustical metal pan ceiling.
3. Stainless steel pans for acoustical metal pan ceiling.
4. Metal suspension system for acoustical, standard-grid metal pan ceilings.
5. Metal suspension system for acoustical, snap-in metal pan ceilings.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements

- for low-emitting materials.
4. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
7. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
8. Laboratory Test Reports: For Insulation, indicating compliance with requirements for low-emitting materials.
9. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.
10. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.
12. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
13. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
14. Environmental Product Declaration: For each product.
15. Health Product Declaration: For each product.
16. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
17. Environmental Product Declaration: For each product.
18. Environmental Product Declaration: For each product.
19. Environmental Product Declaration: For each product.
20. Third-Party Certifications: For each product.
21. Third-Party Certified Life Cycle Assessment: For each product.

C. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** in size.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Metal Pans: Set of **[full-size][6-inch- (150-mm-) square]** Samples of each type, finish, color, pattern, and texture. Show pan edge profile.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of **6-inch- (150-mm-) long** Samples of each type, finish, and color.
3. Sound Absorber: Sample of each type matching size of Sample metal pan.

F. Delegated Design Submittals: For design of **[seismic restraints and]** attachment devices.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.

2. Structural members to which suspension systems will be attached.
3. Size and location of access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. **<Insert item>**.
5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical metal pan ceiling, for tests performed by **[manufacturer and witnessed by a qualified testing agency][a qualified testing agency]**.

D. Evaluation Reports: For each acoustical metal pan ceiling suspension system **[and anchor and fastener type]**.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Metal Pans: Full-size units **[with sound absorber]** equal to **[2]<Insert number>** percent of quantity installed.
2. Suspension-System Components: Quantity of each grid, exposed molding, and trim equal to **[2]<Insert number>** percent of quantity installed.
3. Hold-Down Clips: **[Equal to 2 percent of quantity installed]<Insert number>**.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as indicated on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical metal pans, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle acoustical metal pans, suspension-system components, and accessories carefully to avoid damaging units and finishes in any way.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design **[seismic restraints and]** attachment devices.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E1264 for **[Class A][Class B][Class C]** materials.
 - 2. Smoke-Developed Index: **[50][450]<Insert value>** or less.

2.2 ACOUSTICAL METAL PANS, GENERAL

- A. Source Limitations: Obtain each type of acoustical metal ceiling pan and supporting suspension system from single source from single manufacturer.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- C. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25][50]<Insert value>** percent.
- D. Recycled Content of Insulation: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- E. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less, except for insulation manufactured without formaldehyde.
- H. Insulation shall comply with the requirements of the California Department of Public Health's "Standard

Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- I. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- J. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- K. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- L. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- M. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- N. Acoustical Panel Standard: Provide manufacturer's standard pans of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is **15-3/4 inches (400 mm)** away from test surface in accordance with ASTM E795.
- O. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
 1. Aluminum Sheet: Rolled aluminum sheet, complying with **ASTM B209 (ASTM B209M)**; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
 2. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C635/C635M.
 - a. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A879/A879M, **13Z (40G)** coating, surface treatment as recommended by finish manufacturer for type of use and finish indicated.
 - b. Chemical/Mechanical Finishes: Uncoated steel sheet complying with ASTM A1008/A1008M with luster or bright finish as required by finisher for applying electroplating or other metallic-finishing processes.
 3. Stainless Steel Sheet: Complying with ASTM A240/A240M or ASTM A666, **[Type 304][Type 430]<Insert type>**.
- P. Sound-Absorbent Fabric Layer: Provide fabric layer, sized to fit concealed surface of pan, and consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing in accordance with ASTM E84.
 1. Bond fabric layer to panels in the factory with manufacturer's standard nonflammable adhesive.

- Q. Sound-Absorbent Pads: Provide width and length to completely fill concealed surface of pan, with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing in accordance with ASTM E84, and to comply with the following requirements:
1. Plastic Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, PVC plastic sheet encapsulating unfaced mineral-fiber insulation complying with ASTM C553, Type I, Type II, or Type III, and as follows:
 - a. Mineral-Fiber Type and Thickness: Glass fiber; [1 inch (25 mm)][1-1/2 inches (38 mm)][3 inches (76 mm)]<Insert dimension>.
 - b. Mineral-Fiber Density: [3/4 lb/cu. ft. (12 kg/cu. m)][1 lb/cu. ft. (16 kg/cu. m)][1-1/2 lb/cu. ft. (24 kg/cu. m)]<Insert value>.
 - c. Plastic Sheet Thickness and Color: Not less than 0.003 inch (0.076 mm); [clear][flat black][white].
 2. Unwrapped, Glass-Fiber Insulation: Black coated, unfaced, complying with ASTM C553, Type I, Type II, or Type III; treated to be nondusting; [1 inch (25 mm)][1-1/2 inches (38 mm)]<Insert dimension> thick.
 3. Spacer Grids: Provide manufacturer's standard [aluminum][galvanized-steel] grid units that provide an air cushion between metal pans and insulation pads and that act to improve sound absorption.
- R. Sound Attenuation Panels: Provide manufacturer's standard [aluminum][galvanized-steel] unperforated metal backing unit that acts as a sound attenuation pan to reduce sound travel through ceiling plenum into adjoining rooms.
1. Sound-Absorbent Pads: Provide secondary sound-absorbent pads, [same as specified for primary sound-absorbent pads]<Insert requirements>, for placement over sound attenuation pan to reduce plenum sound.
- S. Adhesive: Manufacturer's standard nonflammable adhesive for sound-absorbent [fabric][and][pads].
1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.3 ALUMINUM PANS FOR ACOUSTICAL METAL PAN CEILING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[American Decorative Ceilings, Inc.]**
 2. **[Armstrong Ceiling & Wall Solutions]**
 3. **[CertainTeed; SAINT-GOBAIN]**
 4. **[Gage Corporation International (The)]**
 5. **[Lindner Group]**
 6. **[Rockfon; ROCKWOOL International]**
 7. **[USG Corporation]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[American Decorative Ceilings, Inc.]**
 2. **[Armstrong Ceiling & Wall Solutions]**
 3. **[CertainTeed; SAINT-GOBAIN]**
 4. **[Gage Corporation International (The)]**
 5. **[Lindner Group]**
 6. **[Rockfon; ROCKWOOL International]**
 7. **[USG Corporation]**
 8. **<Insert manufacturer's name>**
- C. Classification: Units complying with ASTM E1264 for **[Type VII, perforated aluminum facing (pan) with mineral- or glass-fiber-base backing][Type XX, other types described as perforated aluminum facing (pan) units with sound-absorbent fabric backing][Type XX, other types described as unperforated aluminum facing (pan) units]<Insert Type XX description>**.
1. Pattern A: Perforated, regularly spaced large holes, arranged in **[diagonal][parallel]** alignment to pan edge with uniform perforations of dimension, holes per square foot or inch, and percent open area as **[indicated by product designation][selected from manufacturer's full range]**.
 2. Pattern B: Perforated, small holes regularly spaced, with uniform perforations of dimension, holes per square foot or inch, and percent open area as **[specified by product designation][selected from manufacturer's full range]**.
 3. Pattern: **<Insert pattern designation for perforated pans and any requirements for perforation alignment, hole shape and size, holes per square foot or inch, percent open area, and border requirements>**.
- D. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.
1. Lay-in Pans: Formed to set in exposed suspension grid.
 2. Clip-in Pans: Designed to clip in and be securely retained in exposed suspension grid by formed edges or accessory clips provided by manufacturer.
 3. Snap-in Pans: Designed with dimples or continuous beads on flanges for snap-in, secure engagement with concealed suspension system.
 4. Torsion-Spring-Hinged Pans: Designed to be securely retained in preslotted, exposed suspension grid by torsion springs provided by manufacturer.
 5. **<Insert type and description>**.
- E. Pan Thickness: Not less than **[0.019 inch (0.5 mm)][0.025 inch (0.6 mm)][0.032 inch (0.8 mm)][0.040 inch (1.0 mm)]<Insert dimension>**.

- F. Pan Edge Detail: **[Square][Beveled][Reveal][Manufacturer's standard edge detail]**.
- G. Pan Joint Detail: **[Butt][Wide reveal, not less than 15/16 inch (24 mm) wide][Narrow reveal, not greater than 9/16 inch (15 mm) wide][Flush narrow reveal, not greater than 9/16 inch (15 mm) wide]<Insert description>**.
- H. Pan Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][12 by 36 inches (305 by 915 mm)][24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][24 by 60 inches (610 by 1525 mm)][30 by 30 inches (760 by 760 mm)][30 by 60 inches (760 by 1525 mm)][As indicated on Drawings]<Insert dimensions>**.
- I. Scoring: Score pans at intervals to appear as **[12-by-12-inch (305-by-305-mm)]<Insert dimensions>** ceiling units.
- J. Pan Face Finish: **[Mill][Lacquered mill][Clear anodized][Clear mirror anodized][Painted white][Painted to match color indicated by product designation][Painted to match Architect's sample][Painted in color selected from manufacturer's full range][Bright-reflective metallic finish selected from manufacturer's full range]<Insert finish>**.
- K. Light Reflectance Coefficient: Not less than **[0.70][0.75]<Insert number>**.
- L. NRC: Not less than **[0.60][0.65][0.70][0.75][0.80][0.85][0.90][0.95]<Insert number>**.
- M. Ceiling Attenuation Class: Not less than **[35][40][45]<Insert number>**.

2.4 STEEL PANS FOR ACOUSTICAL METAL PAN CEILING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[American Decorative Ceilings, Inc.]**
 - 2. **[Armstrong Ceiling & Wall Solutions]**
 - 3. **[CertainTeed; SAINT-GOBAIN]**
 - 4. **[Lindner Group]**
 - 5. **[Rockfon; ROCKWOOL International]**
 - 6. **[USG Corporation]**
 - 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[American Decorative Ceilings, Inc.]**
 - 2. **[Armstrong Ceiling & Wall Solutions]**
 - 3. **[CertainTeed; SAINT-GOBAIN]**
 - 4. **[Lindner Group]**
 - 5. **[Rockfon; ROCKWOOL International]**
 - 6. **[USG Corporation]**
 - 7. **<Insert manufacturer's name>**
- C. Classification: Units complying with ASTM E1264 for **[Type V, perforated steel facing (pan) with mineral- or glass-fiber-base backing][Type XX, other types described as perforated steel facing (pan) units with sound-absorbent fabric backing][Type XX, other types described as unperforated steel facing (pan) units]<Insert Type XX description>**.

1. Pattern A: (Perforated, regularly spaced large holes), arranged in **[diagonal][parallel]** alignment to pan edge with uniform perforations of dimension, holes per square foot or inch, and percent open area as **[indicated by product designation][selected from manufacturer's full range]**.
 2. Pattern B: (Perforated, small holes) regularly spaced, with uniform perforations of dimension, holes per square foot or inch, and percent open area as **[specified by product designation][selected from manufacturer's full range]**.
 3. Pattern: **<Insert pattern designation for perforated pans and any requirements for perforation alignment, hole shape and size, holes per square foot or inch, and percent open area>**.
- D. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.
1. Lay-in Pans: Formed to set in exposed suspension grid.
 2. Clip-in Pans: Designed to clip in and be securely retained in exposed suspension grid by formed edges or accessory clips provided by manufacturer.
 3. Snap-in Pans: Designed with dimples or continuous beads on flanges for snap-in, secure engagement with concealed suspension system.
 4. Torsion-Spring-Hinged Pans: Designed to be securely retained in preslotted, exposed suspension grid by torsion springs provided by manufacturer.
 5. **<Insert type and description>**.
- E. Pan Thickness: Not less than **[0.010 inch (0.25 mm)][0.019 inch (0.5 mm)][0.025 inch (0.6 mm)][0.030 inch (0.75 mm)][0.036 inch (0.9 mm)]<Insert dimension>**.
- F. Pan Edge Detail: **[Square][Beveled][Reveal][Manufacturer's standard edge detail]**.
- G. Pan Joint Detail: **[Butt][Wide reveal, not less than 15/16 inch (24 mm) wide][Narrow reveal, not greater than 9/16 inch (15 mm) wide][Flush narrow reveal, not greater than 9/16 inch (15 mm) wide]<Insert description>**.
- H. Pan Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][12 by 36 inches (305 by 915 mm)][24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][24 by 60 inches (610 by 1525 mm)][30 by 30 inches (760 by 760 mm)][30 by 60 inches (760 by 1525 mm)][As indicated on Drawings]<Insert dimensions>**.
- I. Scoring: Score pans at intervals to appear as **[12-by-12-inch (305-by-305-mm)]<Insert dimensions>** ceiling units.
- J. Pan Face Finish: **[Painted white][Painted to match color indicated by product designation][Painted to match Architect's sample][Painted in color selected from manufacturer's full range][Plated with metallic finish, as selected from manufacturer's full range][Bright-reflective metallic finish selected from manufacturer's full range]<Insert finish>**.
- K. Light Reflectance Coefficient: Not less than **[0.70][0.75]<Insert number>**.
- L. NRC: Not less than **[0.60][0.65][0.70][0.75][0.80][0.85][0.90][0.95]<Insert number>**.
- M. Ceiling Attenuation Class: Not less than **[35][40][45]<Insert number>**.
- 2.5 STAINLESS STEEL PANS FOR ACOUSTICAL METAL PAN CEILING
- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Armstrong Ceiling & Wall Solutions]**
 2. **[Rockfon; ROCKWOOL International]**
 3. **[USG Corporation]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Armstrong Ceiling & Wall Solutions]**
 2. **[Rockfon; ROCKWOOL International]**
 3. **[USG Corporation]**
 4. **<Insert manufacturer's name>**
- C. Classification: Units complying with ASTM E1264 for **[Type VI, perforated stainless steel facing (pan) with mineral- or glass-fiber-base backing][Type XX, other types described as perforated stainless steel facing (pan) units with sound-absorbent fabric backing][Type XX, other types described as unperforated stainless steel facing (pan) units]<Insert Type XX description>**.
1. Pattern A: (Perforated, regularly spaced large holes), arranged in parallel alignment to pan edge with uniform perforations of **0.109-inch (2.8-mm)** diameter, 1800 holes/sq. ft. or inch, and 11.8 percent open area.
 2. Pattern: **<Insert pattern designation for perforated pans and any requirements for perforation alignment, hole shape and size, holes per square foot or inch, and percent open area>**.
- D. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.
1. Lay-in Pans: Formed to set in exposed suspension grid.
 2. Clip-in Pans: Designed to clip in and be securely retained in exposed suspension grid by formed edges or accessory clips provided by manufacturer.
 3. Snap-in Pans: Designed with dimples or continuous beads on flanges for snap-in, secure engagement with concealed suspension system.
 4. Torsion-Spring-Hinged Pans: Designed to be securely retained in preslotted, exposed suspension grid by torsion springs provided by manufacturer.
 5. **<Insert type and description>**.
- E. Pan Thickness: Not less than **[0.019 inch (0.5 mm)][0.025 inch (0.6 mm)][0.030 inch (0.76 mm)]<Insert dimension>**.
- F. Pan Edge Detail: **[Square][Beveled][Reveal][Manufacturer's standard edge detail]**.
- G. Pan Joint Detail: **[Butt][Wide reveal, not less than 15/16 inch (24 mm) wide][Narrow reveal, not greater than 9/16 inch (15 mm) wide][Flush narrow reveal, not greater than 9/16 inch (15 mm) wide]<Insert description>**.
- H. Pan Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][12 by 36 inches (305 by 915 mm)][24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][30 by 30 inches (760 by 760 mm)][As indicated on Drawings]<Insert dimensions>**.
- I. Scoring: Score pans at intervals to appear as **[12-by-12-inch (305-by-305-mm)]<Insert dimensions>** ceiling units.
- J. Pan Face Finish: **[Directional Satin Finish: ASTM A480/A480M No. 4][Dull Satin Finish: ASTM A480/A480M No. 6][Mirrorlike Reflective, Nondirectional Polish: ASTM A480/A480M No. 8]<Insert**

finish>.

- K. NRC: Not less than [0.60][0.65][0.70][0.75][0.80][0.85][0.90][0.95]<Insert number>.
- L. Ceiling Attenuation Class: Not less than [35][40][45]<Insert number>.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635/C635M requirements.
- H. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.
- I. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.
- J. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- K. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
- L. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B164, nickel copper alloy for UNS No. N04400 alloy.
4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung, is less than yield stress of wire, but provide not less than **[0.106-inch- (2.69-mm-)] [0.135-inch- (3.5-mm-)] <Insert dimension>** diameter wire.

- M. Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- N. Angle Hangers: Angles with legs not less than **7/8 inch (22 mm)** wide; formed with **0.04-inch- (1.0-mm-)** thick, galvanized-steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation; with bolted connections and **5/16-inch- (8-mm-)** diameter bolts.
- O. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- P. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- Q. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical metal pans in place.
- R. Hold-Down Clips: Manufacturer's standard hold-down clips spaced to secure acoustical metal pans in place **[to molding and trim at perimeter] [at each pan] <Insert requirements>**.
- S. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units unless otherwise indicated.
1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL, STANDARD-GRID METAL PAN CEILINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Armstrong Ceiling & Wall Solutions]**
 2. **[CertainTeed; SAINT-GOBAIN]**
 3. **[Rockfon; ROCKWOOL International]**
 4. **[USG Corporation]**
 5. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Armstrong Ceiling & Wall Solutions]**
 2. **[CertainTeed; SAINT-GOBAIN]**
 3. **[Rockfon; ROCKWOOL International]**
 4. **[USG Corporation]**
 5. **<Insert manufacturer's name>**

C. Suspension System: For **[clip-in][lay-in][torsion-spring-hinged]<Insert type>** pans.

1. Wide-Face, Capped, Double-Web, Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc-coated or hot-dip galvanized in accordance with ASTM A653/A653M, **G30 (Z90)** coating designation, with prefinished, cold-rolled, **15/16-inch- (24-mm-)** wide, sheet metal caps on flanges.
 - a. Structural Classification: **[Intermediate][Heavy]**-duty system.
 - b. End Condition of Cross Runners: **[Override (stepped)][or][butt-edge]** type.
 - c. Face Design: Flat, flush.
 - d. Cap Material: **[Steel][or][aluminum]** cold-rolled sheet.
 - e. Cap Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of metal pan][Plated with metallic finish, as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum]**.
2. Narrow-Face, Capped, Double-Web, Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc-coated or hot-dip galvanized in accordance with ASTM A653/653M, **G30 (Z90)** coating designation, with prefinished, cold-rolled, **9/16-inch- (15-mm-)** wide, sheet metal caps on flanges.
 - a. Structural Classification: **[Intermediate][Heavy]**-duty system.
 - b. End Condition of Cross Runners: **[Override (stepped)][or][butt-edge]** type.
 - c. Face Design: **[Flat, flush][Flanges formed with an integral center reveal]**.
 - d. Cap Material: **[Steel][or][aluminum]** cold-rolled sheet.
 - e. Cap Finish: **[Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of metal pan][Plated with metallic finish, as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum]**.
3. Narrow-Face, Uncapped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc-coated or hot-dip galvanized, to produce structural members with **9/16-inch- (15-mm-)** wide faces.
 - a. Structural Classification: **[Intermediate][Heavy]**-duty system.
 - b. Face Design: With **[1/8-inch- (3.2-mm-)][1/4-inch- (6.35-mm-)]** wide, slotted, box-shaped flange.
 - c. Face Finish: Painted **[white][in color as selected from manufacturer's full range][to match color indicated by manufacturer's designation][to match color of metal pan]**.
4. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized in accordance with ASTM A653/A653M, **G60 (Z180)** coating designation, with prefinished, cold-rolled, **15/16-inch- (24-mm-)** wide, aluminum caps on flanges.
 - a. Structural Classification: **[Intermediate][Heavy]**-duty system.
 - b. Face Design: Flat, flush.
 - c. Face Finish: **[Painted white][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Natural finish]**.
5. Wide-Face, Capped, Double-Web, Stainless Steel Suspension System: Main and cross runners roll formed from and capped with Type 304 or Type 316 stainless steel sheet, with prefinished, cold-rolled, **15/16-inch- (24-mm-)** wide, stainless steel caps on flanges.

- a. Structural Classification: Intermediate-duty system.
- b. Face Design: Flat, flush.
- c. Finish: **[Directional Satin Finish: ASTM A480/A480M No. 4][Dull Satin Finish: ASTM A480/A480M No. 6][Mirrorlike Reflective, Nondirectional Polish: ASTM A480/A480M No. 8]<Insert finish>**.

- 6. Suspension System for Torsion-Spring-Hinged Metal Pans: Provide runners with factory-cut slots fabricated to accept torsion-spring-hinged attachment.

2.8 METAL SUSPENSION SYSTEM FOR ACOUSTICAL SNAP-IN METAL PAN CEILINGS

A. Snap-In Grid Suspension System: .

- 1. Manufacturers: Subject to compliance with requirements, provide products by snap-in metal pan ceiling manufacturer.

B. Indirect-Hung, Snap-in System: Designed to support metal pans that snap into main runners, consisting of main runners connected to carrying channels that are attached by hangers to building structure, and complying with the following requirements:

1. Main Runners: Formed from the following metal:

- a. Aluminum Sheet: Alloy and temper recommended by aluminum producer and finisher for type of use indicated and manufacturer's standard finish, complying with **ASTM B209 (ASTM B209M)**.
- b. Electrolytic Zinc-Coated Steel Sheet: ASTM A879/A879M, with not less than **[08Z (24G)]<Insert coating designation>** zinc coating.
- c. Hot-Dip Galvanized Steel: ASTM A653/A653M, with not less than **[G60 (Z180)]<Insert coating designation>** zinc coating.
- d. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 302 or Type 304, stretcher leveled, with cold-rolled mill finish.
- e. Metal Sheet: Metal as standard with ceiling system manufacturer, with factory-applied protective finish complying with ASTM C635/C635M.

2. Carrying Channels:

- a. Same member and metal as indicated for main runners.
- b. Cold-rolled steel, not less than **0.060-inch (1.5-mm)** nominal thickness of base (uncoated) metal and **7/16-inch- (11-mm-)** wide flanges, **[protected with rust-inhibitive paint][hot-dip galvanized in accordance with ASTM A653/A653M, G60 (Z180) coating designation]**, and as follows:

- 1) Depth and Weight: **[1-1/2 inches and 475 lb/1000 feet (38 mm and 215 kg/305 m)][2 inches and 590 lb/1000 feet (51 mm and 268 kg/305 m)]**.

C. Direct-Hung, Snap-in System: Designed to support metal pans that snap into main runners, consisting of main runners supported by hangers attached directly to building structure, and complying with the following requirements:

- 1. Hangers: Angles or channels, as standard with ceiling system manufacturer, formed from same metal as main runners.
- 2. Main Runners: Rolled aluminum sheet; alloy and temper recommended by aluminum producer and finisher for type of use indicated and manufacturer's standard finish, complying with **ASTM B209 (ASTM B209M)**.

- D. Access Panels: For access at locations indicated, provide acoustical snap-in metal pan ceiling units, accessible by **[key or tool][two access knobs; place one access knob at each end of panel near corners]**.
1. Access Key or Tool: Provide manufacturer's standard key or tool for opening access panels; **[one][two]<Insert number>**.

2.9 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

2.10 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. High-Humidity Finish: Comply with ASTM C635/C635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

2.11 ALUMINUM FINISHES

- A. Mill Finish: AA-M10C10 (Mechanical Finish: as fabricated, unspecified; Chemical Finish: chemically cleaned).
- B. Lacquered Mill Finish: AA-M10C10R1x (Mechanical Finish: as fabricated, unspecified; Chemical Finish: chemically cleaned; Organic Coating: as specified below).
1. Organic Coating: Manufacturer's standard clear organic coating.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- D. Clear Mirror Anodic Finish: AA-M21C12A212, 0.005 mm or thicker.
- E. Color-Coated Finish: Manufacturer's standard **[powder-coat]** baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.
- F. Bright-Reflective Finish: Manufacturer's standard chemical/mechanical bright-reflective metallic finish complying with finish manufacturer's written instructions for surface preparation, pretreatment, process, protective coating, and minimum thickness to produce a finish uniform in appearance and free of blisters, pits, roughness, nodules, burning, cracks, unfinished areas, and other visible defects.

2.12 METALLIC-COATED STEEL SHEET FINISHES

- A. Color-Coated Finish: Manufacturer's standard **[powder-coat]** baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

2.13 STEEL SHEET FINISHES

- A. Electroplated Finish: Electroplating process complying with finish manufacturer's written instructions for surface preparation, pretreatment, process, and minimum thickness to produce a coating uniform in appearance and free of blisters, pits, roughness, nodules, burning, cracks, unplated areas, and other visible defects.
- B. Bright-Reflective Finish: Manufacturer's standard chemical/mechanical bright-reflective metallic finish complying with finish manufacturer's written instructions for surface preparation, pretreatment, process, protective coating, and minimum thickness to produce a finish uniform in appearance and free of blisters, pits, roughness, nodules, burning, cracks, unfinished areas, and other visible defects.

2.14 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and coordination drawings.

3.3 INSTALLATION OF ACOUSTICAL METAL PAN CEILINGS

- A. General: Install acoustical metal pan ceiling assemblies to comply with ASTM C636/C636M[, **seismic design requirements,**] and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum

- that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required[**and, if permitted with fire-resistance-rated ceilings,**] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling suspension members[**or carrying channels**] and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that do not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to ceiling suspension members[**or carrying channels**] and to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members[**or carrying channels**] and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pans.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3.2 mm in 3.6 m)**. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet. Cut and treat edges to comply with manufacturer's written instructions.
- G. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim. Comply with manufacturer's installation tolerances.

1. For lay-in, square-edge pans, install pans with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. For lay-in, reveal-edge pans on suspension-system runners, install pans with bottom of reveal in firm contact with top surface of runner flanges.
 3. For lay-in, reveal-edge pans on suspension-system members with box-shaped flanges, install pans with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 4. For **[clip-in][torsion-spring-hinged]** pans, position pans in accordance with manufacturer's written instructions.
 5. For snap-in pans, fit adjoining units to form flush, tight joints.
 6. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 7. Fit adjoining units to form flush, tight joints.
 8. Install directionally patterned or textured metal pans in directions indicated.
 9. Install sound-absorbent fabric layers in, and bond to, perforated metal pans.
 10. Install sound-absorbent pads in perforated metal pans[**over metal spacer grids**].
- H. Install sound attenuation panels in areas indicated by reflected ceiling plans or room finish schedules. Lay panels directly on ceiling system and close major openings to form complete coverage in required areas. Lay second sound-absorbent pads on sound attenuation panels.
- I. Install hold-down clips where indicated.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage][Engage]** a qualified special inspector to perform the following special inspections:
1. Seismic design compliance.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical metal panel ceiling hangers, anchors, and fasteners in successive stages. Do not proceed with installations of acoustical metal panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed.
 - a. Within each test area, testing agency selects one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and tests them for **200 lbf (890 N)** of tension; it also selects one of every two postinstalled anchors used to attach bracing wires to concrete and tests them for **440 lbf (1957 N)** of tension.
 - b. When tested fasteners and anchors do not comply with requirements, testing agency tests those fasteners and anchors not previously tested until 20 pass consecutively and then resumes initial testing frequency.
- D. Acoustical metal panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings, after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 09 51 33 00



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Task	Specification	Specification Description
09 51 33 13	09 51 33 00	Acoustical Metal Pan Ceilings
09 51 33 23	09 51 33 00	Acoustical Metal Pan Ceilings
09 51 33 33	09 51 33 00	Acoustical Metal Pan Ceilings
09 53 23 00	09 51 13 00	Acoustical Panel Ceilings



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SECTION 09 54 00 00 - SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood, linear-panel ceilings.
2. Wood, linear-plank ceilings.
3. Wood, grille-panel ceilings.
4. Wood, open-cell panel ceilings.
5. Wood-veneer, tegular-panel ceilings.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.

1.6 COORDINATION

- A. Coordinate layout and installation of wood ceilings and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.
1. <Insert participant requirements>.

1.8 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for certified wood.>
2. <Double click to insert sustainable design text for certified wood.>
3. <Double click to insert sustainable design text for composite wood.>
4. <Double click to insert sustainable design text for adhesives.>
5. <Double click to insert sustainable design text for recycled content.>
6. <Double click to insert sustainable design text for EPDs and HPDs.>
7. <Double click to insert sustainable design text for EPDs and HPDs.>
8. <Double click here to insert sustainable design text for extended producer responsibility.>

C. Shop Drawings: For suspended wood ceilings.

1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:
 - a. Wood ceiling patterns and joints.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - e. Ceiling perimeter and penetrations through ceiling; trim and moldings.

D. Samples: For each exposed product and for each type, color, and finish specified, 12 inches (305 mm) long by 12 inches (305 mm) wide or full width in size.

E. Samples for Initial Selection: For units with factory-applied colors and finishes.

1. Include Samples of accessories involving color and finish selections.

F. Samples for Verification: For the following products:

1. Wood Ceilings: 12-inch- (305-mm-) long by 12-inch- (305-mm-) wide or full-width Samples of each type, color, and finish.
2. Suspension-System Members: 12-inch- (305-mm-) long Sample of each type.
3. Exposed Molding and Trim: 12-inch- (305-mm-) long Samples of each type, color, and finish.
4. Veneer Edge Banding: Applied to a cut end of a wood-ceiling Sample for each type, color, and finish.
5. Filler Strips: 12-inch- (305-mm-) long Samples of each type, color, and finish.
6. Sound Absorbers: 12 inches (305 mm) long by full width.

G. Delegated Design Submittals: For design of[**seismic restraints and**] attachment devices.

1.9 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each suspended wood ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For suspended-wood-ceiling framing systems.
- D. Field quality control reports.

1.10 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Suspended-Wood-Ceiling Components: Quantity of each wood-ceiling unit, suspension-system component, accessory, and exposed molding and trim equal to [2] <Insert number> percent of quantity installed.

1.12 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program for testing indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of each type of suspended wood ceiling as shown on Drawings.
 - a. Demonstrate treatment of exposed field cuts.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 4. <Double click to insert sustainable design text for certified wood.>
 - 5. <Double click to insert sustainable design text for composite wood products.>

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - 1. Store materials flat and level, raised from the floor.
- B. Handle ceiling components and accessories in a manner that prevents damage.

1.14 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
 - 1. Store and acclimatize wood products in the spaces where they will be installed for a minimum of 72 hours immediately before ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to design **[seismic restraints and]**attachment devices.
- B. Structural Performance: Exterior suspended wood ceilings to withstand exterior exposure, the effects of gravity loads, and the following loads and stresses without showing permanent deformation of ceiling system components or permanent damage to fasteners and anchors:
 - 1. Wind Load: Uniform pressure **[indicated on Drawings]** **<Insert requirements>**, acting inward or outward.
- C. Seismic Criteria: Provide suspended wood ceilings designed and installed to withstand the effects of earthquake motions in accordance with **[ASTM E580/E580M]** **[CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings - Seismic Zones 0-2"]** **[CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4"]** **[ASCE/SEI 7]** **<Insert requirements>** and requirements of authorities having jurisdiction.
 - 1. <Double click to insert sustainable design text for composite wood products.>
 - 2. <Double click to insert sustainable design text for certified wood.>
 - 3. <Double click to insert sustainable design text for low-emitting adhesives and sealants.>
 - 4. <Double click to insert sustainable design text for recycled content.>
 - 5. <Double click to insert sustainable design text for sealant.>
- D. Recycled Content of Composite-Wood Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[50]** **<Insert value>** percent.

2.2 WOOD, LINEAR-PANEL CEILINGS

- A. Solid-Wood, Linear-Panel Ceilings **<Insert drawing designation>**: Linear panels fabricated from kiln-dried solid-wood planks **[free of knots]** **[with up to 1/2-inch- (13-mm-) diameter knots]** and without finger joints, cracks, checks, or warp. Planks run parallel to panel length.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Plank:
 - a. Species: **[Ash]** **[Poplar]** **[Red oak]** **[Western hemlock]** **<Insert species>**.
 - b. Cut: **[Manufacturer's standard]** **<Insert requirements>**.
 - c. Width: **[3-1/4 inches (83 mm)]** **[5-1/4 inches (133 mm)]** **<Insert dimension>**.
 - d. Depth: **[3/4 inch (19 mm)]** **<Insert dimension>**.
 - e. Length: **[96 inches (2438 mm)]** **<Insert dimension>**.
 - f. Edges: **[Square]** **<Insert requirements>**.
 - g. Reveal Spacing: **[Equal spacing]** **[3/4 inch (19 mm)]** **<Insert dimension>** between long edges of planks.
 - h. Backing Boards: Manufacturer's standard, **[1/2-inch- (13-mm-)]** **<Insert dimension>** thick **[solid-wood boards]** **[or]** **[HPVA HP-1 hardwood plywood]** **<Insert requirements>**.
 - 1) Backing Board Gloss and Color: **[Flat black]** **<Insert requirements>**.
 - 3. Panel Module: **[12 by 96 by 1-1/4 inches (305 by 2438 by 32 mm)]** **<Insert requirements>**.

- a. Attachment: Provide **[manufacturer's standard metal spring clips]** **[black, zinc-aluminum coated steel sheet metal screws recommended in manufacturer's written installation instructions through factory pre-drilled holes in backing boards]** **<Insert requirements>** for attaching panels to grid suspension system, spaced to support ceiling and in accordance with manufacturer's written installation instructions.
4. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"]** **[As specified in Section 099646 "Intumescent Painting"]** **[Manufacturer's standard interior finish]** **[Manufacturer's standard exterior sealer and finish]** **<Insert requirements>**; applied on every wood surface.
 - a. Surface-Burning Characteristics: Provide **[manufacturer's standard]** **<Insert requirements>** intumescent finish system with the following characteristics when tested in accordance with ASTM E84:
 - 1) Flame-Spread Index: **[25]** **<Insert value>** or less.
 - 2) Smoke-Developed Index: **[450]** **<Insert value>** or less.
 - b. Finish: **[Clear]** **[White lacquer]** **[Tinted finish in color selected by Architect from manufacturer's standard]** **<Insert requirements>**.
 - c. Stain: **[As selected by Architect from manufacturer's standard range]** **[Match Architect's sample]** **<Insert requirements>**.
 - d. Gloss: **[Manufacturer's standard]** **[Satin]** **[Semigloss]** **[High gloss]** **<Insert requirements>**.
5. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
 - a. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated]** **[Nonwoven fire-retardant cotton fiber]** **[Nonwoven black mineral fiber]** **[Nonwoven black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene]** **[1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene]** **<Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50]** **<Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75]** **<Insert value>** when tested in accordance with ASTM C423.
 - b. Acoustic Felt: **[Manufacturer's standard]** **[Nonwoven cellulose- and glass-fiber fabric]** **<Insert requirements>**, factory applied, black, backer with flame-spread index of 25 or less and smoke-developed index of **[450]** **<Insert value>** or less as determined by testing in accordance with ASTM E84.
 - c. End Caps: Manufacturer's standard units for exposed field-cut edges; solid wood finished to match planks.
 - d. Trim: **[As indicated on Drawings]** **<Insert requirements>**; manufacturers standard solid wood finished to match planks; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - e. Insert additional accessories required to suit Project.
 - f. **<Insert accessory>**.
6. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.

- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation]** **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)]** **<Insert dimension>**.
 - d. Finish: **[Flat black]** **<Insert requirements>**.
- B. Wood-Veneer, Linear-Panel Ceilings **<Insert drawing designation>**: Linear panels fabricated from planks consisting of wood veneer adhered to backs and exposed surfaces of **[manufacturer's standard]** **[ANSI A208.2 medium density fiberboard]** **[ANSI A208.1 particle board]** **<Insert requirements>** composite-wood cores. Planks run parallel to panel length.
1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: **[25]** **<Insert value>** or less.
 - b. Smoke-Developed Index: **[50]** **[450]** **<Insert value>** or less.
 3. Plank:
 - a. Face Grade: **[Manufacturer's standard]** **[Grade A based on the Decorative Hardwoods Association's HPVA HP-1 definitions and characteristics]** **<Insert requirements>**.
 - b. Adhesive: **[Manufacturer's standard that complies with "Performance Requirements" Article]** **<Insert requirements>**.
 - c. Species: **[Bamboo]** **[Beech]** **[Birch]** **[Cherry]** **[Maple]** **[Red oak]** **[Walnut]** **<Insert species>**.
 - d. Cut: **[Manufacturer's standard]** **[Plain sliced (flat cut)]** **[Quarter sliced]** **[Rift cut]** **[Rotary cut]** **<Insert requirements>**.
 - e. Width: **[4 inches (102 mm)]** **[6 inches (152 mm)]** **<Insert dimension>**.
 - f. Depth: **[3/4 inch (19 mm)]** **<Insert dimension>**.
 - g. Length: **[96 inches (2438 mm)]** **<Insert dimension>**.
 - h. Edges: **[Square]** **<Insert requirements>**.
 - i. Reveal Spacing: **[Equal spaces]** **[3/4 inch (19 mm)]** **[1/4 inch (6 mm)]** **<Insert requirements>** between long edges of planks.
 - j. Backing Boards: **[Manufacturer's standard]** **<Insert requirements>**; **[1/2 inch (13 mm)]** **<Insert dimension>** thick.
 - 1) Backing Board Gloss and Color: **[Flat black]** **<Insert requirements>**.
 4. Panel Module: **[24 by 96 by 1-1/4 inches (610 by 2438 by 32 mm)]** **<Insert requirements>**.
 - a. Attachment: Provide manufacturer's standard **[attachment hooks or clips]** **<Insert requirements>** for attaching panels to grid suspension system, spaced to support ceiling loads and in accordance with manufacturer's written installation instruction.
 5. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"]** **[Manufacturer's standard finish]** **<Insert requirements>**; applied on every wood surface.
 - a. Finish: **[Clear]** **[White lacquer]** **[Tinted finish in color selected by Architect from manufacturer's standard]** **<Insert requirements>**.
 - b. Stain: **[As selected by Architect from manufacturer's standard range]** **[Match Architect's sample]** **<Insert requirements>**.

- c. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>**.
- 6. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
 - a. Safety Cables: 24 inches (610 mm).
 - b. Panel Splice Plates: Manufacturer's standard.
 - c. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated] [Nonwoven fire-retardant cotton fiber] [Nonwoven black mineral fiber] [Nonwoven black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] [1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] <Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75] <Insert value>** when tested in accordance with ASTM C423.
 - d. Acoustic Felt: **[Manufacturer's standard] [Nonwoven cellulose- and glass-fiber fabric] <Insert requirements>**, factory applied, black, backer with flame-spread index of 25 or less and smoke-developed index of **[450] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - e. End Caps: Manufacturer's standard units for exposed field-cut edges; solid wood finished to match planks.
 - f. Trim: **[As indicated on Drawings] <Insert requirements>**; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - 1) Material: **[Solid wood finished to match planks] [Aluminum, painted black]** with trim connectors recommended by manufacturer. **<Insert requirements>**.
 - g. **<Insert accessory>**.
- 7. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
 - a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation] [ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap] <Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty] <Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)] <Insert dimension>**
 - d. Finish: **[Flat black] <Insert requirements>**.

2.3 WOOD, LINEAR-PLANK CEILINGS

- A. Solid-Wood, Linear-Plank Ceilings **<Insert drawing designation>**: Kiln-dried, solid-wood planks **[free of knots] [with up to 1/2-inch- (13- mm-) diameter knots]**; without finger joints, cracks, checks, or warp, and with square-cut ends.
 - 1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 - 2. Plank:
 - a. Species: **[Birch] [Cherry] [Maple] [Red oak] <Insert species>**.

- b. Cut: **[Manufacturer's standard] [Plain sawn (flat cut)] [Rift cut] <Insert requirements>**.
 - c. Width: **[4 inches (102 mm)] [6 inches (152 mm)] <Insert dimension>**.
 - d. Depth: **[5/8 inch (16 mm)] [3/4 inch (19 mm)] <Insert dimension>**.
 - e. Length: **[Random] [96 inches (2438 mm)] <Insert dimension>**.
 - f. Edge: **[Tongue-and-groove, V-groove joint] [Tongue-and-groove, flat V-groove joint] [Tongue-and-groove, butt joint] [Radius] [Square] <Insert requirements>**.
 - 1) Reveal: **[3/8 inch (10 mm)] [1/2 inch (13 mm)] [3/4 inch (19 mm)] <Insert dimension>** between long edges of planks.
 - 2) Reveal Filler Strip: **[Black PVC] [Black felt with flame-spread index of 25 or less and smoke-developed index of 450 or less as determined by testing in accordance with ASTM E84] <Insert requirements>**.
 - g. End Joints: **[Butt] [Doweled] <Insert requirements>**.
3. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"] [As specified in Section 099646 "Intumescent Painting"] [Manufacturer's standard interior finish] <Insert requirements>**; applied on every wood surface.
- a. Surface-Burning Characteristics: Provide **[manufacturer's standard] <Insert requirements>** intumescent finish system with the following characteristics when tested in accordance with ASTM E84:
 - 1) Flame-Spread Index: **[25] <Insert value>** or less.
 - 2) Smoke-Developed Index: **[450] <Insert value>** or less.
 - b. Finish: **[Clear] [White lacquer] [Tinted finish in color selected by Architect from manufacturer's standard] <Insert requirements>**.
 - c. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>**.
 - d. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>**.
4. Accessories: Linear-ceiling-plank manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
- a. Attachment Clips: **[Manufacturer's standard metal clips] <Insert requirements>** for attaching planks to grid suspension system.
 - b. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated] [Nonwoven fire-retardant cotton fiber] [Nonwoven black mineral fiber] [Nonwoven black cellulose- and glass-fiber fabric] [Nonwoven black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] [1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] <Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.78] <Insert value>** when tested in accordance with ASTM C423.
 - c. Trim: **[As indicated on Drawings] <Insert requirements>**; in wood species and finished to match panels; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
5. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system

complete with suspension-system components required to support ceiling units and other ceiling-supported construction.

- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation] [ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap] <Insert requirements>.**
 - b. Structural Classification: **[Heavy-duty] <Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)] <Insert dimension>.**
 - d. Finish: **[Flat black] <Insert requirements>.**
- B. Wood-Veneer, Linear-Plank Ceilings **<Insert drawing designation>**: Planks consisting of wood veneer adhered to backs and exposed surfaces of **[manufacturer's standard] [ANSI A208.2 medium density fiberboard] [ANSI A208.1 particle board] <Insert requirements>** composite-wood cores; with square-cut ends.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: **[25] <Insert value>** or less.
 - b. Smoke-Developed Index: **[50] [450] <Insert value>** or less.
 3. Plank:
 - a. Face Grade: **[Manufacturer's standard] [Grade A based on the Decorative Hardwoods Association's HPVA HP-1 definitions and characteristics] <Insert requirements>.**
 - b. Adhesive: **[Manufacturer's standard that complies with "Performance Requirements" Article] <Insert requirements>.**
 - c. Species: **[Bamboo] [Birch] [Cherry] [Maple] [Red oak] <Insert species>.**
 - d. Cut: **[Manufacturer's standard] [Plain sliced (flat cut)] [Rift cut] <Insert requirements>.**
 - e. Width: **[4 inches (102 mm)] [6 inches (152 mm)] <Insert dimension>.**
 - f. Depth: **[5/8 inch (16 mm)] [3/4 inch (19 mm)] <Insert dimension>.**
 - g. Length: **[96 inches (2438 mm)] <Insert dimension>.**
 - h. Long Edge: **[Square] [Square with tongues cut for inserting leveling splines or fillers] [Tongue-and-groove, butt joint] <Insert requirements>.**
 - 1) Reveal/Plank Spacing: **[3/8 inch (10 mm)] [1/2 inch (13 mm)] [3/4 inch (19 mm)] <Insert dimension>** between long edges of planks.
 - 2) Reveal Filler Strip: **[Black PVC] [Black felt] <Insert requirements>.**
 - i. End Joints: **[Butt] [Doweled] <Insert requirements>.**
 4. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"] [Manufacturer's standard finish] <Insert requirements>**; applied on every wood surface.
 - a. Finish: **[Clear] [White lacquer] [Tinted finish in color selected by Architect from manufacturer's standard] <Insert requirements>.**
 - b. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>.**
 - c. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>.**
 5. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.

- a. Attachment Clips: **[Manufacturer's standard metal clips]** **<Insert requirements>** for attaching planks to suspension system.
 - 1) Plank Splice Plates: Manufacturer's standard.
 - b. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated]** **[Nonwoven fire-retardant cotton fiber]** **[Nonwoven black mineral fiber]** **[Nonwoven black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene]** **[1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene]** **<Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50]** **<Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75]** **<Insert value>** when tested in accordance with ASTM C423.
 - c. Edge Banding: Manufacturer's standard matching planks for treating cut edges; with pressure-sensitive adhesive backing.
 - d. Trim: **[As indicated on Drawings]** **<Insert requirements>**; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - 1) Material: **[Wood-veneer-wrapped aluminum, finished to match planks]** **[Wood-veneered composite wood, finished to match planks]** **<Insert requirements>**.
 - e. **<Insert accessory>**.
6. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation]** **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)]** **<Insert dimension>**.
 - d. Finish: **[Flat black]** **<Insert requirements>**.
7. Linear-Carrier Suspension System: ASTM C635/C635M and recommended in writing by ceiling and suspension-system manufacturer for applications indicated; complete with factory-applied linear clips spaced to match plank modules, splice sections, stabilizer, and suspension-system components required to support ceiling units and other ceiling-supported construction.
- a. Material: **[ASTM A653/A653M, hot-dipped galvanized, cold-rolled sheet steel, G60 (Z180) coating designation]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Carrier Splices: Same metal, profile, and finish as for carriers.
 - d. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers.
 - e. Finish: **[Flat black]** **<Insert requirements>**.

2.4 WOOD, GRILLE-PANEL CEILINGS

- A. Solid-Wood, Grille-Panel Ceilings: Kiln-dried, solid-wood rails **[free of knots]** **[with up to 1/2-inch- (13-mm-) diameter knots]** and without finger joints, cracks, checks, and warp secured to wood panel backing that maintains equal rail spacing and prevents rail twisting and warping.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. Rails:
 - a. Species: **[Birch]** **[Cherry]** **[Maple]** **[Poplar]** **[Red oak]** **<Insert species>**.
 - b. Cut: **[Manufacturer's standard]** **[Plain sliced (flat cut)]** **[Rift cut]** **<Insert requirements>**.
 - c. Dimensions: **<Insert dimensions>**.
 - d. Spacing: **[1-1/2 inches (38 mm)]** **[2 inches (51 mm)]** **<Insert dimension>**.
 - e. Profile: **[Square]** **[Radius]** exposed, horizontal face.
 - f. Stabilizing Backer Strips: Manufacturer's standard **[flat]** **[notched]** **<Insert description>** type that attaches rails together; spaced at not more than **[12 inches (305 mm)]** **<Insert dimension>** o.c.
 - 1) Material and Finish: **[Solid wood with manufacturer's standard black finish]** **[Solid wood of same species and with same finish as rails]** **[1/2-inch- (13-mm-) thick hardwood plywood, complying with requirements in the Decorative Hardwoods Association's HPVA HP-1, with manufacturer's standard black finish]** **<Insert requirements>** applied on every surface.
 - g. Dowels: Manufacturer's standard dowels that attach rails together; spaced at not more than **[12 inches (305 mm)]** **<Insert dimension>** o.c. and **[5-1/2 inches (140 mm)]** **<Insert dimension>** from panel ends.
 - 1) Material and Finish: **[Solid wood with manufacturer's standard black finish]** **[Solid wood of same species and with same finish as rails]** **<Insert requirements>**.
 3. Panel Module: **[24 by 24 inches (610 by 610 mm)]** **[12 by 48 inches (305 by 1219 mm)]** **[12 by 72 inches (305 by 1829 mm)]** **[12 by 96 inches (305 by 2438 mm)]** **[12 by 120 inches (305 by 3048 mm)]** **<Insert dimensions>**.
 - a. Type: **[Lay-in]** **[Clip-attached]** **[Screw-attached]** **<Insert requirements>** installation on grid suspension system.
 - 1) Attachment Clips: **[Panel manufacturer's standard black, corrosion-resistant, metal spring clips that allow downward access of panels]** **<Insert requirements>**.
 - 2) Attachment Screws: **[Manufacturer's standard]** **<Insert requirements>**.
 4. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"]** **[As specified in Section 099646 "Intumescent Painting"]** **[Manufacturer's standard finish]** **<Insert requirements>**; applied on every wood surface.
 - a. Surface-Burning Characteristics: Provide **[manufacturer's standard]** **<Insert requirements>** intumescent finish system with the following characteristics when tested in accordance with ASTM E84:
 - 1) Flame-Spread Index: **[25]** **<Insert value>** or less.
 - 2) Smoke-Developed Index: **[450]** **<Insert value>** or less.



- b. Finish: **[Clear] [White lacquer] [Tinted finish in color selected by Architect from manufacturer's standard] <Insert requirements>.**
 - c. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>.**
 - d. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>.**
- 5. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
 - a. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated] [Nonwoven fire-retardant cotton fiber] [Nonwoven black mineral fiber] <Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75] <Insert value>** when tested in accordance with ASTM C423.
 - b. Acoustic Felt: **[Manufacturer's standard] [Nonwoven cellulose- and glass-fiber fabric] <Insert requirements>**, factory applied, black, backer with flame-spread index of 25 or less and smoke-developed index of **[450] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - c. Trim: **[As indicated on Drawings] <Insert requirements>**; in wood species and finished to match rails; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - d. **<Insert accessory>.**
- 6. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
 - a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation] [ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap] <Insert requirements>.**
 - b. Structural Classification: **[Heavy-duty] <Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)] [9/16 inch (14 mm)].**
 - d. Finish: **[Flat black] <Insert requirements>.**
- B. Wood-Veneer, Grille-Panel Ceilings **<Insert drawing designation>**: Grille panels fabricated from rails consisting of wood veneer adhered to backs and exposed surfaces of **[manufacturer's standard] [ANSI A208.2 medium density fiberboard] [ANSI A208.1 particle board] <Insert requirements>** composite-wood cores.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: **[25] <Insert value>** or less.
 - b. Smoke-Developed Index: **[50] [450] <Insert value>** or less.
 - 3. Rails:
 - a. Face Grade: **[Manufacturer's standard] [Grade A based on the Decorative Hardwoods Association's HPVA HP-1 definitions and characteristics] <Insert requirements>.**

- b. Adhesive: **[Manufacturer's standard that complies with "Performance Requirements" Article] <Insert requirements>**.
 - c. Species: **[Beech] [Birch] [Cherry] [Maple] [Red oak] [Walnut] <Insert species>**.
 - d. Cut: **[Manufacturer's standard] [Plain sliced (flat cut)] [Quarter sliced] [Rift cut] [Rotary cut] <Insert requirements>**.
 - e. Dimensions: **<Insert dimensions>**.
 - f. Spacing: **[1-1/2 inches (38 mm)] [2 inches (51 mm)] <Insert dimension>**.
 - g. Profile: **[Square] [Radius] exposed, horizontal face**.
 - h. Stabilizing Backer Strips: Manufacturer's standard **[flat] [notched] <Insert description>** type that attach rails together; spaced at not more than **[12 inches (305 mm)] <Insert dimension>** o.c.
 - 1) Material and Finish: **[1/2-inch- (13-mm-) thick hardwood plywood, complying with requirements in the Decorative Hardwoods Association's HPVA HP-1, with manufacturer's standard black finish] [Material and finish matching rails] <Insert requirements>**; with finish applied to every surface.
 - i. Dowels: Manufacturer's standard dowels that attach rails together; spaced at not more than **[12 inches (305 mm)] <Insert dimension>** o.c. and **[5-1/2 inches (140 mm)] <Insert dimension>** from panel ends.
 - 1) Material and Finish: **[Solid wood with manufacturer's standard black finish] [Solid wood of same species and with same finish as rails] <Insert requirements>**.
4. Panel Module: **[24 by 24 inches (610 by 610 mm)] [12 by 48 inches (305 by 1219 mm)] [12 by 72 inches (305 by 1829 mm)] [12 by 96 inches (305 by 2438 mm)] [12 by 120 inches (305 by 3048 mm)] <Insert dimensions>**.
- a. Type: **[Lay-in] [Clip-attached] [Screw-attached] <Insert requirements>** installation on grid suspension system.
 - 1) Attachment Clips: **[Panel manufacturer's standard black, corrosion-resistant, metal spring clips that allow downward access of panels] <Insert requirements>**.
 - 2) Attachment Screws: **[Manufacturer's standard] <Insert requirements>**.
5. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"] [Manufacturer's standard finish] <Insert requirements>**; applied on every wood surface.
- a. Finish: **[Clear] [White lacquer] <Insert requirements>**.
 - b. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>**.
 - c. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>**.
6. Accessories: Wood-grille-panel manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
- a. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated] [Nonwoven fire-retardant cotton fiber] [Nonwoven black mineral fiber] <Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75] <Insert value>** when tested in accordance with ASTM C423.

- b. Acoustic Felt: **[Manufacturer's standard] [Nonwoven cellulose- and glass-fiber fabric]** **<Insert requirements>**, factory applied, black, backer with flame-spread index of 25 or less and smoke-developed index of **[450]** **<Insert value>** or less as determined by testing in accordance with ASTM E84.
 - c. Veneer Edge Banding: Manufacturer's standard matching planks for treating cut edges; with pressure-sensitive adhesive backing.
 - d. Trim: **[As indicated on Drawings]** **<Insert requirements>**; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - 1) Material: **[Wood-veneer-wrapped aluminum, finished to match rails] [Wood-veneered composite matching rails] [Solid wood finished to match rails]** with trim connectors recommended by manufacturer. **<Insert requirements>**.
 - e. **<Insert accessory>**.
7. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation] [ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Width: **[15/16 inch (24 mm)] [9/16 inch (14 mm)]**.
 - d. Finish: **[Flat black]** **<Insert requirements>**.

2.5 WOOD, OPEN-CELL PANEL CEILINGS

- A. Solid-Wood, Open-Cell Panel Ceilings: Open-cell panels fabricated from kiln-dried, solid-wood blades **[free of knots] [with up to 1/2-inch- (13-mm-) diameter knots]** and without finger joints, cracks, checks, and warp; designed for lay-in installation in ceiling suspension grid.
- 1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 - 2. Blades;
 - a. Species: **[Birch] [Cherry] [Maple] [Poplar] [Red oak]** **<Insert species>**.
 - b. Cut: **[Manufacturer's standard] [Plain sliced (flat cut)] [Rift cut]** **<Insert requirements>**.
 - c. Depth: **[Manufacturer's standard] [2 inches (51 mm)] [2-1/4 inches (57 mm)]** **<Insert dimension>**.
 - d. Thickness: **[Manufacturer's standard] [3/8 inch (10 mm)] [1/2 inch (13 mm)] [3/4 inch (19 mm)]** **<Insert dimension>**.
 - e. Pattern: Blades form cells **[as indicated on Drawings] [nominally 4 inches (102 mm) square] [nominally 6 inches (152 mm) square] [nominally 6 inches (152 mm) by 24 inches (610 mm)] [nominally 12 inches (305 mm) square] [nominally 12 inches (305 mm) by 24 inches (610 mm)]** **<Insert requirements>**.
 - 3. Panel Module: **[24 inches (610 mm) square] [24 by 48 inches (610 by 1219 mm)]** **<Insert dimensions>**.
 - a. Depth: **[Manufacturer's standard] [2 inches (51 mm)] [2-1/4 inches (57 mm)]** **<Insert dimension>**.
 - b. Edges: Manufacturer's standard for **[flush] [reveal]** installation.

- 1) Reveal Depth: **[Manufacturer's standard]** **<Insert dimension>**.
4. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"]** **[As specified in Section 099646 "Intumescent Painting"]** **[Manufacturer's standard interior finish]** **<Insert requirements>**; applied on every wood surface.
 - a. Surface-Burning Characteristics: Provide **[manufacturer's standard]** **<Insert requirements>** intumescent finish system with the following characteristics when tested in accordance with ASTM E84:
 - 1) Flame-Spread Index: **[25]** **<Insert value>** or less.
 - 2) Smoke-Developed Index: **[450]** **<Insert value>** or less.
 - b. Finish: **[Clear]** **[White lacquer]** **[Tinted finish in color selected by Architect from manufacturer's standard]** **<Insert requirements>**.
 - c. Stain: **[As selected by Architect from manufacturer's standard range]** **[Match Architect's sample]** **<Insert requirements>**.
 - d. Gloss: **[Manufacturer's standard]** **[Satin]** **[Semigloss]** **[High gloss]** **<Insert requirements>**.
5. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
 - a. Hold-Down Clips: Manufacturer's standard.
 - b. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated]** **[Nonwoven fire-retardant cotton fiber]** **[Nonwoven black mineral fiber]** **<Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50]** **<Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75]** **<Insert value>** when tested in accordance with ASTM C423.
 - c. Trim: **[As indicated on Drawings]** **<Insert requirements>**; in wood species and finished to match rails; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - d. **<Insert accessory>**.
6. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
 - a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation]** **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)]** **[9/16 inch (14 mm)]**.
 - d. Finish: **[Flat black]** **<Insert requirements>**.
- B. Wood-Veneer, Open-Cell Panel Ceilings: Open-cell panel fabricated from blades consisting of wood veneer adhered to backs and exposed surfaces of **[manufacturer's standard]** **[ANSI A208.2 medium density fiberboard]** **[ANSI A208.1 particle board]** **<Insert requirements>** composite-wood cores; designed for lay-in installation in ceiling suspension grid.
 1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**

2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: **[25] <Insert value>** or less.
 - b. Smoke-Developed Index: **[50] [450] <Insert value>** or less.
3. Blades:
 - a. Face Grade: **[Manufacturer's standard] [Grade A based on the Decorative Hardwoods Association's HPVA HP-1 definitions and characteristics] <Insert requirements>**.
 - b. Adhesive: **[Manufacturer's standard that complies with "Performance Requirements" Article] <Insert requirements>**.
 - c. Species: **[Beech] [Birch] [Cherry] [Maple] [Red oak] [Walnut] <Insert species>**.
 - d. Cut: **[Manufacturer's standard] [Plain sliced (flat cut)] [Quarter sliced] [Rift cut] [Rotary cut] <Insert requirements>**.
 - e. Depth: **[Manufacturer's standard] [2 inches (51 mm)] [2-1/4 inches (57 mm)] <Insert dimension>**.
 - f. Thickness: **[Manufacturer's standard] [3/8 inch (10 mm)] [1/2 inch (13 mm)] [3/4 inch (19 mm)] <Insert dimension>**.
 - g. Pattern: Blades form cells **[as indicated on Drawings] [nominally 4 inches (102 mm) square] [nominally 6 inches (152 mm) square] [nominally 6 inches (152 mm) by 24 inches (610 mm)] [nominally 12 inches (305 mm) square] [nominally 12 inches (305 mm) by 24 inches (610 mm)] <Insert requirements>**.
4. Panel Module: **[24 inches (610 mm) square] [24 by 48 inches (610 by 1219 mm)] <Insert dimensions>**.
 - a. Depth: **[Manufacturer's standard] [2 inches (51 mm)] [2-1/4 inches (57 mm)] <Insert dimension>**.
 - b. Edges: Manufacturer's standard for **[flush] [reveal]** installation.
 - 1) Reveal Depth: **[Manufacturer's standard] <Insert dimension>**.
5. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"] [Manufacturer's standard finish] <Insert requirements>**; applied on every wood surface.
 - a. Finish Type: **[Clear] [White lacquer] <Insert requirements>**.
 - b. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>**.
 - c. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>**.
6. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
 - a. Hold-Down Clips: Manufacturer's standard.
 - b. Acoustic Infill Panels: **[Manufacturer's standard to provide NRC rating indicated] [Nonwoven fire-retardant cotton fiber] [Nonwoven black mineral fiber] <Insert requirements>**, with flame-spread index of 25 or less and smoke-developed index of **[50] <Insert value>** or less as determined by testing in accordance with ASTM E84.
 - 1) NRC: **[0.75] <Insert value>** when tested in accordance with ASTM C423.
 - c. Edge Banding: Manufacturer's standard matching planks for treating cut edges; with pressure-sensitive adhesive backing.

- d. Trim: **[As indicated on Drawings]** **<Insert requirements>**; with trim connectors recommended in writing by ceiling and suspension system manufacturers.
 - 1) Material: **[Wood-veneer-wrapped aluminum, finished to match blades]** **[Wood-veneered composite matching blades]** **<Insert requirements>**.
 - e. Wood Veneer Strips: For adhering to face of grid suspension system in the field; manufacturer's standard in wood species and finish to match blades.
 - f. **<Insert accessory>**.
7. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation]** **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap]** **<Insert requirements>**.
 - b. Structural Classification: **[Heavy-duty]** **<Insert requirements>** system.
 - c. Face Width: **[15/16 inch (24 mm)]** **<Insert dimension>**.
 - d. Finish: **[Flat black]** **<Insert requirements>**.

2.6 WOOD-VENEER, TEGULAR-PANEL CEILINGS

- A. Wood-Veneer, Tegular-Panel Ceilings **<Insert drawing designation>**: Panels consisting of wood veneer bonded to both faces of composite-wood core with exposed edges **[banded with the same veneer finish as the face]** **[with manufacturer's standard black finish]** **<Insert requirements>**.
- 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 - 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: **[25]** **<Insert value>** or less.
 - b. Smoke-Developed Index: **[50]** **[450]** **<Insert value>** or less.
 - 3. Tegular Panels:
 - a. Face Grade: **[Manufacturer's standard]** **[Grade A based on the Decorative Hardwoods Association's HPVA HP-1 definitions and characteristics]** **<Insert requirements>**.
 - b. Adhesive: **[Manufacturer's standard that complies with "Performance Requirements" Article]** **<Insert requirements>**.
 - c. Species: **[Bamboo]** **[Beech]** **[Birch]** **[Cherry]** **[Maple]** **[Red oak]** **[Walnut]** **<Insert species>**.
 - d. Cut: **[Manufacturer's standard]** **[Plain sliced (flat cut)]** **[Quarter sliced]** **[Rift cut]** **[Rotary cut]** **<Insert requirements>**.
 - e. Perforation Pattern: **[As indicated by manufacturers designation]** **<Insert requirements>**.
 - 1) NRC Rating: Not less than **[0.70]** **[0.75]** **[0.85]** **<Insert value>** when tested in accordance with ASTM C423.
 - f. Acoustical Backing: **[Manufacturer's standard to provide NRC rating indicated for perforation pattern indicated]** **[Nonwoven fire-retardant cotton fiber]** **[Nonwoven black mineral fiber]** **[Nonwoven black cellulose- and glass-fiber fabric]** **[Nonwoven**

- black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] [1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene] <Insert requirements>, with flame-spread index of 25 or less and smoke-developed index of [50] [450] <Insert value> or less as determined by testing in accordance with ASTM E84.**
- g. Surface Pattern: **[As indicated by manufacturers designation] <Insert requirements>.**
4. Panel Module: **[24 inches (610 mm) square] [24 by 48 inches (610 by 1219 mm)] <Insert dimensions>.**
- a. Depth: **[Manufacturer's standard] [1/2 inch (13 mm)] [3/4 inch (19 mm)] <Insert dimension>.**
- b. Edges: Manufacturer's standard for **[flush, lay-in] [reveal, lay-in] [concealed, lay-in] <Insert requirements>** grid installation.
- c. Reveal Depth: **[Manufacturer's standard] [3/4 inch (19 mm)] <Insert dimension>.**
- d. Reveal Width: **[Manufacturer's standard] [3/8 inch (10 mm)] [5/8 inch (16 mm)] [1 inch (25 mm)] <Insert dimension>.**
5. Factory Finish: **[As specified in Section 099300 "Staining and Transparent Finishing"] [Manufacturer's standard finish] <Insert requirements>;** applied on every wood surface.
- a. Finish Type: **[Clear] [White lacquer] [Tinted finish in color selected by Architect from manufacturer's standard] <Insert requirements>.**
- b. Stain: **[As selected by Architect from manufacturer's standard range] [Match Architect's sample] <Insert requirements>.**
- c. Gloss: **[Manufacturer's standard] [Satin] [Semigloss] [High gloss] <Insert requirements>.**
6. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
- a. Attachment Clips: Manufacturer's standard screw attached to back face of panels with square-cut edges to produce concealed-grid installation and allowing downward removal of ceiling panels.
- b. Hold-Down Clips: Manufacturer's standard that maintain proper seating of kerfed panel edges.
- c. Safety Clips: Manufacturer's standard to prevent panels from dropping when disengaged from the suspension system.
- d. Safety Cables: Manufacturer's standard to prevent panels **[weighing 20 lb (9 kg) or more] <Insert requirements>** from falling to floor in event of grid failure.
- e. Border Clips: Manufacturer's standard **[spring] [screw-attached] <Insert requirements>** type.
- f. Grid-Stabilizer Clips: Manufacturer's standard for oversize panels.
- g. Panel-Fixing Clip or Bracket: Manufacturer's standard that positively secures border and cut panels to the suspension system, so they cannot be removed from below.
- h. Veneer Edge Banding: Manufacturer's standard matching panels for treating cut edges; with pressure-sensitive adhesive backing.
- i. Solid-Wood Grid Cover: In same species as panel veneer; factory finished to match panel faces; **[3/4 inch (19 mm) thick and 2 inches (51 mm) wide and in manufacturer's standard profile] <Insert requirements>.**
- j. Wood-Board Edge Trim: Manufacturer's standard **[with core, veneer, and finish matching panel] <Insert requirements>**, complete with splice plates, clips, and brackets required for a complete installation in accordance with manufacturer's written instructions.
- 1) Board Width: **[4 inches (102 mm)] [6 inches (152 mm)] <Insert dimension>.**

2) Board Depth: **[3/4 inch (19 mm)] <Insert dimension>**.

k. **<Insert accessory requirements>**.

7. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.

- a. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation] [ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation with ASTM B209 (ASTM B209M) aluminum cap] <Insert requirements>**.
- b. Structural Classification: **[Heavy-duty] <Insert requirements>** system.
- c. Face Width: **[15/16 inch (24 mm)] [9/16 inch (14 mm)]**.
- d. Finish: **[Flat black] <Insert requirements>**.

2.7 SUSPENSION-SYSTEM HANGERS, BRACES, AND TIES

A. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.

1. Cast-in-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[5] <Insert safety factor>** times that imposed by ceiling construction as determined by testing in accordance with ASTM E488/E488M or ASTM E1512, as applicable, conducted by a qualified testing and inspecting agency.

- a. Type: **[Cast-in-place] [Postinstalled expansion] [Postinstalled bonded]** anchors.
- b. Corrosion Protection:

- 1) Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
- 2) Stainless steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchors.
- 3) Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **[10] <Insert safety factor>** times that imposed by ceiling construction as determined by testing in accordance with ASTM E1190 conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:

- 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
- 2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
- 3. Nickel-Copper-Alloy Wire: ASTM B164 nickel-copper alloy UNS No. N04400.
- 4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung is less than yield stress of wire, but provide not less than **[0.106-inch- (2.7-mm-)] [0.135-inch- (3.4-mm-)] <Insert dimension>** diameter wire.

C. Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

- D. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed from 0.04-inch- (1.0-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- E. Seismic Stabilizer Bars: Grid-suspension-system manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- F. Seismic Struts: Suspension-system manufacturer's standard compression struts designed to accommodate seismic forces.
- G. Exterior Bracing: Cold-rolled steel channels and angles, hot-dip galvanized to comply with ASTM A653/A653M, G60 (Z180) coating designation; size and profile as required to withstand wind load.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of suspended wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of suspended wood ceilings.
 - 1. Balance border widths at opposite edges of each ceiling.
 - 2. Avoid using less-than-half-width units.

3.3 INSTALLATION OF SUSPENDED WOOD CEILINGS

- A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 3 inches (76 mm). Connect hangers directly either to structures or to inserts,

- eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts[, **power-actuated fasteners**,] or postinstalled mechanical or adhesive anchors that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1219 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (203 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns in 1-1/2 inches (38 mm). Suspend bracing from building's structural members as required for hangers and without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim at perimeter of ceiling area and where necessary to conceal edges and ends of wood units.
1. Screw-attach metal moldings to substrate at intervals of not more than 16 inches (406 mm) o.c. and not more than 3 inches (76 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 ft. (3 mm in 3.7 m). Miter corners accurately and connect securely.
 2. Do not use exposed fasteners on moldings and trim.
- E. Grid Suspension Systems: Space main beams at 48 inches (1219 mm) o.c.
1. Install cross tees to form [**modules sized in accordance with manufacturer's written installation instructions**] [**24- by 48-inch (610- by 1219-mm) modules**] [**24-inch (610-mm) square modules**] <Insert requirements>.
 2. Remove and replace dented, bent, or kinked members.
- F. Linear-Carrier Suspension Systems: Install carriers at no more than [**24 inches (610 mm)**] <Insert dimension> o.c. aligned and securely interlocked with one another.
1. Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.
 2. Remove and replace dented, bent, or kinked members.
- G. Install wood components and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.
- H. Cut wood components for accurate fit at borders and at interruptions and penetrations by other work through ceilings.
1. Stiffen edges of cut wood components as required to eliminate variations in flatness.

- I. Treat field-cut edges of wood components in accordance with manufacturer's written recommendations; finish exposed field cuts to match factory finish.
 - 1. Solid-Wood Planks: **[Use solid-wood end caps to conceal exposed field-cut edges]** <Insert requirements>.
 - 2. Wood-Veneer Units: **[Edge band exposed field-cut edges]** <Insert requirements>.
- J. Install wood components in coordination with suspension system and moldings and trim.
 - 1. **[Install wood components in patterns indicated on Drawings]** <Insert requirements>.
- K. Install field-constructed access panels in locations indicated on Drawings.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage]** **[Engage]** a qualified special inspector to perform the following special inspections:
 - 1. Suspended ceiling system.
 - 2. Hangers, anchors, and fasteners.
 - 3. **<Insert special inspections>**.
- B. Testing Agency: **[Owner will engage]** **[Engage]** a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections: Testing and inspecting of completed installations of ceiling hangers, anchors, and fasteners to take place in successive stages, in test areas and using methods as follows. Do not proceed with installations of ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before wood ceilings have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented units.



END OF SECTION 09 54 00 00



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SECTION 09 54 00 00A - STRETCHED-FABRIC CEILING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stretched-fabric ceiling systems.
- B. Related Requirements:
 - 1. Section 095446 "Fabric-Wrapped Ceiling Panels" for decorative, fabric-wrapped ceiling panels that are not required to be tested for acoustical performance[**and for coordinated requirements for fabric**].
 - 2. Section 097200 "Wall Coverings" for adhesively applied textile wall coverings[**and for coordinated requirements for fabric**].
 - 3. Section 097713 "Stretched-Fabric Wall Systems" for site-upholstered systems applied to walls[**and for coordinated requirements for fabric**].
 - 4. Section 098436 "Sound-Absorbing Ceiling Units" for shop-fabricated, acoustical ceiling panels tested for acoustical performance[**and for coordinated requirements for fabric**].

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound absorption average.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For stretched-fabric ceiling systems.
 - 1. Include[**fabric facing**,] frame edge and trim, core material, and mounting indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 6. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.

7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
8. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
9. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
10. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each stretched-fabric system.

1. Include the following:
 - a. Reflected ceiling plans, elevations, sections, and installation and system details.
 - b. Details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate frame-edge profile and core materials.
 - c. Details at cutouts and penetrations for other work.
 - d. Direction of fabric weave and pattern matching.
2. Show sewn-seam locations, types, and methods.

D. Samples for Initial Selection: For each type of fabric facing.

1. Include accessories involving color or finish selection.

E. Samples for Verification: For the following:

1. Fabric: Full-width by approximately **[36-inch- (900-mm-)]<Insert dimension>** long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Frame System: **12-inch- (300-mm-)** square Sample(s) showing each edge profile and corner.
3. Core Material: **12-inch- (300-mm-)** square Sample at corner.
4. Assembled System: Approximately **36 by 36 inches (900 by 900 mm)**, including joints[**and seams**] in mockup.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets.
2. Suspended ceiling components above stretched-fabric systems.
3. Structural members to which suspension devices will be attached.
4. Items penetrating or covered by stretched-fabric systems including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. **<Insert item>**.

5. Show operation of hinged and sliding components covered by or adjacent to stretched-fabric systems.

- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of stretched-fabric system.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fabric: For each fabric, color, and pattern installed, furnish length equal to **[10]<Insert number>** percent of amount installed, but no fewer than **[10 sq. yd. (9 sq. m)]<Insert quantity>**, full width of bolt.
 2. Framing and Related Installation Items: Furnish manufacturer's full-length units equal to **[5]<Insert number>** percent of amount installed, but no fewer than **[5]<Insert number>** units, including unopened adhesives.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 1. Build mockup of typical ceiling area[**as shown on Drawings**][**96 inches (2400 mm) wide by full width of ceiling**]**<Insert dimensions>**. [**Include intersection of wall and ceiling, corners, and perimeters.**]
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install stretched-fabric systems until **[a permanent level of lighting][a lighting level of not less than 50 fc (538 lx)]<Insert requirement>** is provided on surfaces to receive stretched-fabric systems.
- C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors, such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.11 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain stretched-fabric ceiling systems specified in this Section **[and stretched-fabric wall systems specified in Section 097713 "Stretched-Fabric Wall Systems"]** from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

- D. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Fire-Test-Response Characteristics: Stretched-fabric ceiling systems comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency on systems prepared in accordance with ASTM E2573. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested in accordance with NFPA 286.

2.3 STRETCHED-FABRIC CEILING SYSTEMS

- A. Stretched-Fabric Ceiling System : Manufacturer's standard system consisting of facing material stretched tightly over a frame **[and core material]** and secured in the frame.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Accutrack Systems, LLC]**
 - b. **[Acoustical Fabric Systems Inc]**
 - c. **[Novawall Systems, Inc]**
 - d. **[SnapTex International LLC]**
 - e. **[SoftWalls, Inc.]**
 - f. **[Whisper Walls]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Accutrack Systems, LLC]**
 - b. **[Acoustical Fabric Systems Inc]**
 - c. **[Novawall Systems, Inc]**
 - d. **[SnapTex International LLC]**
 - e. **[SoftWalls, Inc.]**
 - f. **[Whisper Walls]**
 - g. **<Insert manufacturer's name>**
 - 3. Core: **[Manufacturer's standard][Glass-fiber board][Glass-fiber blanket][Mineral-fiber board][Cementitious-fiber board][Medium-density fiberboard][Particleboard]<Insert requirement>**.
 - a. Nominal Core Thickness: **[Match nominal frame thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on**

Drawings]<Insert dimension>.

4. Core Overlay: Polyester batting [1/2 inch (13 mm) thick][Manufacturer's standard thickness]<Insert dimension>.
5. Frame Edge: [Chamfered (beveled)][Radiused (bullnosed)][Square]<Insert profile> profile.
 - a. Fabric-Insertion Point: [Bottom load][Side load][Top load].
 - b. Nominal Frame Thickness: [Match nominal core thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.
6. Frame Color: [Natural][Black][White][Prepainted color as selected by Architect from full range of manufacturer's colors]<Insert requirement>.
7. Reveals between Panels: [Recessed][Flush][Projecting] reveals [as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.
8. Facing Material: [Owner-furnished material][As indicated on Drawings]<Insert drawing designation>.
9. Acoustical Performance: Sound absorption [NRC][or][SAA] of [0.50 to 0.90][0.60 to 0.70][0.65 to 0.75][not less than 0.65][not more than 0.35]<Insert range or single value> in accordance with ASTM C423 for [Type A]<Insert mounting> mounting in accordance with ASTM E795.
10. Nominal Overall System Thickness: [Match nominal frame thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.

2.4 MATERIALS

A. Sustainable Design Requirements:

1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
4. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
5. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Core Materials:[Manufacturer's standard.]

1. Glass-Fiber Board: ASTM C612, of type standard with manufacturer; nominal density of [6 to 7 lb/cu. ft. (96 to 112 kg/cu. m)]<Insert values>, unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Glass-Fiber Blanket: ASTM C553, ASTM C612, or ASTM C665; of type standard with manufacturer; nominal density of [3 to 4 lb/cu. ft. (48 to 64 kg/cu. m)]<Insert values>; flexible;

- and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
3. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of [13 lb/cu. ft. (208 kg/cu. m)][20 lb/cu. ft. (320 kg/cu. m)], and with perforated surface.
4. Cementitious-Fiber Board: Density of not less than [20 lb/cu. ft. (320 kg/cu. m)]<Insert value>.
5. Medium-Density Fiberboard: Panels complying with ANSI A208.2, [grade to suit performance requirements][Grade 130]<Insert grade>.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less when tested in accordance with ASTM E84 or UL 723.
6. Particleboard: Panels complying with ANSI A208.1, [grade to suit performance requirements][Grade M-2]<Insert grade>.
 - a. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less when tested in accordance with ASTM E84 or UL 723.
7. Core Overlay: Flame-retardant, compressible, fiberfill, polyester batting.
- C. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).
- D. Facing Material : Fabric from same dye lot; color and pattern [as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.
 1. Manufacturer: <Insert manufacturer's name>.
 2. Product Line/Pattern: <Insert product name or designation>.
 3. Pattern Repeat: <Insert requirement>.
 4. Style Number: <Insert number>.
 5. Color: <Insert name or number, or both>.
 6. Fiber Content: [100]<Insert number> percent [woven polyester][nonwoven polyester][polyolefin][acoustically transparent vinyl]<Insert fiber requirement>.
 7. Width: [54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>.
 8. Source: <Insert fabric-vendor's name>.
 9. Applied Treatments: [Stain resistance][flame retardant][acrylic backing, single coat][acrylic backing, double coat][latex backing][foam backing][and][knit backing]<Insert treatment>.
 10. Light Reflectance: Average value not less than [0.75]<Insert value> when tested in accordance with ASTM E1477.
 11. Lining Material: [Manufacturer's standard fabric for each use indicated]<Insert material designation>.
 12. Trim Strip: <Insert material designation>.
- E. Lining Material <Insert material designation>: Fabric [as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.
 1. Manufacturer: <Insert manufacturer's name>.
 2. Product Line: <Insert product name or designation>.
 3. Style Number: <Insert number>.
 4. Color: [White]<Insert name or number, or both>.
 5. Fiber Content: <Insert content by percentage and fiber type>.
 6. Width: [54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>.

7. Source: **<Insert fabric-vendor's name>**.
8. Applied Treatments: **[Stain resistance][and][flame retardant]<Insert treatment>**.

F. Trim Strip **<Insert material designation>**: Fabric **[matching facing material except as follows]<Insert requirement>**.

1. Product Line: **<Insert product name or designation>**.
2. Style Number: **<Insert number>**.
3. Color: **[White]<Insert name or number, or both>**.

2.5 INSTALLATION MATERIALS

- A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:
1. Adhesives shall have a VOC content of **[70]<Insert value>** g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
 7. Fasteners: **[Manufacturer's standard]<Insert requirement>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each area and establish layout of panels and joints of **[uniform size with balanced borders at opposite edges][sizes indicated on Drawings]** within a given area.

- B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of **[24]<Insert number>** hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION OF STRETCHED-FABRIC CEILING SYSTEMS

- A. Install stretched-fabric ceiling systems according to system manufacturer's written instructions.
 - 1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.
 - 2. Install framing around penetrations.
 - 3. Tightly fit framing to adjacent construction and securely attach to substrate.
 - 4. Install core material with full coverage, flush with face of stretched-fabric system frame.
 - 5. Attach frame and core to substrate with adhesive or fasteners, or both, to support system and prevent deformation of components.
 - 6. Install stretched-fabric systems true in plane and with fabric square to the grain.
 - 7. Install jointed panels with **[butt joints][and][reveals]<Insert requirement>** as indicated.
- B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
 - 1. Fabric Direction: Run fabric **[as indicated on Drawings]<Insert requirement>**.
 - 2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
 - 3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave **[aligns with adjacent panels][varies from adjacent panels as indicated on Drawings]**.
 - 4. Fabric Seams:
 - a. Sewn seams are not permitted.
 - b. **[Manufacturer's standard][Flat standard][French][Welt-trimmed]<Insert description>** sewn seams, straight and parallel; seam dimensions and locations as indicated on Drawings.
 - 5. Core Overlay: Evenly stretch over core face and edges; free from puckers, ripples, wrinkles, and sags.
 - 6. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.
 - 7. Stretch fabric tightly and square without puckers, ripples, or distortions. Acclimatize and restretch if recommended by stretched-fabric system manufacturer. Repair distortions, wrinkles, and sagging.
 - 8. Trim Strip: Back-wrap trim strip fabric from the fabric-insertion point over the exposed part of the frame edge where indicated, resulting in a contrasting fabric along the edge.

3.4 INSTALLATION TOLERANCES

- A. Edge Straightness: Plus or minus **[1/16 inch (1.6 mm)]<Insert dimension>** in **48 inches (1200 mm)**.
- B. Variation from Alignment with Surfaces: Plus or minus **[1/16 inch (1.6 mm)]<Insert dimension>** in **48 inches (1200 mm)**, noncumulative.
- C. Variation from Level or Slope: Plus or minus **[1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension>**.



-
- D. Variation of Joint Width: Not more than [**1/16 inch (1.6 mm)**]**<Insert dimension>** in 48 inches (1200 mm) from [**hairline**]**[reveal line]**, noncumulative.

3.5 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 54 00 00A

SECTION 09 54 00 00B - FABRIC-WRAPPED CEILING PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Shop-fabricated, fabric-wrapped ceiling panels.
- B. Related Requirements:
 - 1. Section 095443 "Stretched-Fabric Ceiling Systems" for site-upholstered systems applied to ceilings[**and for coordinated requirements for fabric**].
 - 2. Section 097200 "Wall Coverings" for adhesively applied textile wall coverings[**and for coordinated requirements for fabric**].
 - 3. Section 098436 "Sound-Absorbing Ceiling Units" for shop-fabricated, acoustical ceiling panels tested for acoustical performance[**and for coordinated requirements for fabric**].

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product.
 - 1. Include[**fabric facing,**] panel edge, core material, and mounting indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 4. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 5. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 6. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
 - 7. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
 - 8. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
 - 9. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For panel assembly and installation.

1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge profile and core materials.
3. Include direction of fabric weave and pattern matching.

D. Samples for Initial Selection: For each type of fabric facing.

1. Include Samples of hardware and accessories involving color or finish selection.

E. Samples for Verification: For the following products:

1. Fabric: Full-width by approximately [**36-inch- (900-mm-)**]**<Insert dimension>** long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: **12-inch- (300-mm-)** long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: **12-inch- (300-mm-)** square Sample at corner.
4. Mounting Devices: Full-size Samples.
5. Assembled Panels: Approximately **36 by 36 inches (900 by 900 mm)**, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets.
2. Suspended ceiling components above ceiling panels.
3. Structural members to which suspension devices will be attached.
4. Items penetrating or covered by panels including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. **<Insert item>**.
5. Show operation of hinged and sliding components covered by or adjacent to panels.

B. Product Certificates: For each type of panel.

C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of panel to include in maintenance manuals. Include fabric manufacturer's written cleaning and stain-removal instructions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fabric: For each fabric, color, and pattern installed, furnish length equal to **[10]<Insert number>** percent of amount installed, but no fewer than **[10 sq. yd. (9 sq. m)]<Insert quantity>**, full width of bolt.
 - 2. Mounting Devices: Full-size units equal to **[5]<Insert number>** percent of amount installed, but no fewer than **[five]<Insert number>** devices.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical ceiling area[**as shown on Drawings**][**96 inches (2400 mm) wide by full width of ceiling**]**<Insert dimensions>**. [**Include intersection of wall and ceiling, corners, and perimeters.**]
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install panels until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install fabric-wrapped ceiling panels until [**a permanent level of lighting**][**a lighting level of not less than 50 fc (538 lx)**]**<Insert requirement>** is provided on surfaces to receive the panels.
- C. Air-Quality Limitations: Protect panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify panel locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace panels and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge.
 - b. Warping of core.
 - 2. Warranty Period: **[Two]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain fabric-wrapped ceiling panels[**and fabric-wrapped wall panels specified in Section 097723 "Fabric-Wrapped Panels"**] from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Fire-Test-Response Characteristics: Panels are to comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested in accordance with NFPA 286.

2.3 SHOP-FABRICATED FABRIC-WRAPPED CEILING PANELS

- A. Fabric-Wrapped Ceiling Panel : Manufacturer's standard panel construction consisting of facing material [laminated to front face, edges, and back edge border of core][stretched over front face of edge-framed core and bonded or attached to edges and back of frame]<Insert description>.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Acoustical Panel Systems (APS, Inc.)]
 - b. [Acoustical Solutions]
 - c. [Armstrong Ceiling & Wall Solutions]
 - d. [Armstrong World Industries]
 - e. [AVL Systems, Inc]
 - f. [Benton Brothers Solutions, Inc.]
 - g. [Conwed]
 - h. [Decoustics; CertainTeed Architectural Products; a Saint Gobain company]
 - i. [Essi Acoustical Products]
 - j. [G&S Acoustics]
 - k. [Lamvin, Inc]
 - l. [MBI Products Company, Inc]
 - m. [Perdue Acoustics]
 - n. [Sound Concepts]
 - o. [Sound Management Group LLC]
 - p. [Wenger Corporation]
 - q. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Acoustical Panel Systems (APS, Inc.)]
 - b. [Acoustical Solutions]
 - c. [Armstrong Ceiling & Wall Solutions]
 - d. [Armstrong World Industries]
 - e. [AVL Systems, Inc]
 - f. [Benton Brothers Solutions, Inc.]
 - g. [Conwed]
 - h. [Decoustics; CertainTeed Architectural Products; a Saint Gobain company]
 - i. [Essi Acoustical Products]
 - j. [G&S Acoustics]
 - k. [Lamvin, Inc]
 - l. [MBI Products Company, Inc]
 - m. [Perdue Acoustics]
 - n. [Sound Concepts]
 - o. [Sound Management Group LLC]
 - p. [Wenger Corporation]
 - q. <Insert manufacturer's name>
 3. Panel Shape: [Flat][As indicated on Drawings]<Insert shape>.
 4. Mounting: Back mounted with manufacturer's standard [metal clips][suspension system][suspension system with stiffening, back-support angles]<Insert requirement>, secured to substrate.
 5. Core: [Manufacturer's standard][Glass-fiber board][Glass-fiber blanket][Mineral-fiber

- board][Cementitious-fiber board][Medium-density fiberboard][Particleboard]<Insert requirement>.
6. Core Overlay: Polyester batting [1/2 inch (13 mm) thick][manufacturer's standard thickness]<Insert dimension>.
 7. Edge Construction: Manufacturer's standard [chemically hardened core with no frame][extruded-aluminum or zinc-coated, rolled-steel frame][extruded PVC frame][wood frame, rabbeted, and splined with glued joints and machined corners]<Insert requirement>.
 8. Edge Profile: [Chamfered (beveled)][Eased (small radius)][Mitered (beveled to a point)][Radiused (bullnosed)][Square][Custom profile as indicated on Drawings]<Insert profile>.
 9. Corner Detail in Elevation: [Square][Round, radius as indicated on Drawings][Custom as indicated on Drawings]<Insert description> with continuous edge profile indicated.
 10. Reveals between Panels: [Recessed][Flush][Projecting] reveals [as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.
 11. Facing Material: [Owner-furnished material][As indicated on Drawings]<Insert drawing designation>.
 12. Nominal [Core][Overall Panel] Thickness: [3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.
 13. Panel Width: [24 inches (610 mm)][30 inches (762 mm)][48 inches (1220 mm)][As indicated on Drawings]<Insert dimension>.
 14. Panel Height: [72 inches (1829 mm)][96 inches (2438 mm)][108 inches (2743 mm)][120 inches (3048 mm)][As indicated on Drawings]<Insert dimension>.

2.4 MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.
- B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- D. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- G. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.

- H. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- I. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- J. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- K. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- L. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- M. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- N. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- O. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- P. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- Q. Core Materials:[**Manufacturer's standard.**]
 - 1. Glass-Fiber Board: ASTM C612, of type standard with manufacturer; nominal density of [**6 to 7 lb/cu. ft. (96 to 112 kg/cu. m)**]**<Insert value>**, unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
 - 2. Glass-Fiber Blanket: ASTM C553, ASTM C612, or ASTM C665; of type standard with manufacturer; nominal density of [**3 to 4 lb/cu. ft. (48 to 64 kg/cu. m)**]**<Insert value>**; flexible; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
 - 3. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of [**13-lb/cu. ft. (208-kg/cu. m)**][**20-lb/cu. ft. (320-kg/cu. m)**].
 - 4. Cementitious-Fiber Board: Density of not less than [**20 lb/cu. ft. (320 kg/cu. m)**]**<Insert value>**.
 - 5. Medium-Density Fiberboard: Panels complying with ANSI A208.2, [**grade to suit performance requirements**][**Grade 130**]**<Insert grade>**.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less when tested in accordance with ASTM E84 or UL 723.

6. Particleboard: Panels complying with ANSI A208.1, **[grade to suit performance requirements][Grade M-2]<Insert grade>**.
 - a. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less when tested in accordance with ASTM E84 or UL 723.
 7. Core Overlay: Flame-retardant, compressible, fiberfill, polyester batting.
 8. Wood and Plywood: Manufacturer's standard plywood or clear, vertical grain, straight, kiln-dried hardwood.
 - a. Fire-retardant treated by pressure process with a flame spread index of 25 or less when tested in accordance with ASTM E84 or UL 723, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than **10.5 feet (3.2 m)** beyond the centerline of the burners at any time during the test.
 - 1) Treated material is to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity.
 - 2) Kiln-dry material after treatment to 19 percent or less for lumber and 15 percent or less for plywood.
- R. Facing Material : Fabric from same dye lot; color and pattern **[as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>**.
1. Manufacturer: **<Insert manufacturer's name>**.
 2. Product Line/Pattern: **<Insert product name or designation>**.
 3. Pattern Repeat: **<Insert requirement>**.
 4. Style Number: **<Insert number>**.
 5. Color: **<Insert name or number, or both>**.
 6. Fiber Content: **[100]<Insert number> percent [woven polyester][nonwoven polyester][polyolefin][vinyl]<Insert fiber requirement>**.
 7. Width: **[54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>**.
 8. Source: **<Insert fabric-vendor's name>**.
 9. Applied Treatments: **[Stain resistance][flame-retardant][acrylic backing, single coat][acrylic backing, double coat][latex backing][foam backing][and][knit backing]<Insert treatment>**.
 10. Light Reflectance: Average value not less than **[0.75]<Insert value>** when tested in accordance with ASTM E1477.
 11. Lining Material: **[Manufacturer's standard fabric for each use indicated]<Insert material designation>**.
- S. Lining Material **<Insert material designation>**: Fabric **[as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>**.
1. Manufacturer: **<Insert manufacturer's name>**.
 2. Product Line: **<Insert product name or designation>**.
 3. Style Number: **<Insert number>**.
 4. Color: **[White]<Insert name or number, or both>**.
 5. Fiber Content: **<Insert content by percentage and fiber type>**.
 6. Width: **[54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>**.
 7. Source: **<Insert fabric-vendor's name>**.
 8. Applied Treatments: **[Stain resistance][and][flame retardant]<Insert treatment>**.

- T. Mounting Devices: Concealed on back of panel, recommended by manufacturer to support weight of panel.

2.5 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Measure each area and establish layout of panels and joints of **[uniform size with balanced borders at opposite edges][sizes indicated on Drawings]** within a given area.
- C. Edge Hardening: For **[glass-fiber board][and][mineral-fiber board]** cores, chemically harden core edges and areas of core where mounting devices are attached.
- D. Core Overlay: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- E. Facing Material **[and Lining Material]**: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Square Corners: Tailor corners. **[Heat seal vinyl fabric seams at corners.]**
 - 2. Radius and Other Nonsquare Corners: Attach material so there are no seams or gathering of material.
 - 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches adjacent panels.
- F. Dimensional Tolerances of Finished Panels: Plus or minus **1/16 inch (1.6 mm)** for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated panels, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting panel performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panels in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.



- B. Comply with panel manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.
- C. Align fabric pattern and grain[**with adjacent panels**][**as shown on Drawings**].

3.3 INSTALLATION TOLERANCES

- A. Variation from Alignment with Surfaces: Plus or minus [1/16 inch (1.6 mm)]<Insert dimension> in 48 inches (1200 mm), noncumulative.
- B. Variation from Level or Slope: Plus or minus [1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension>.
- C. Variation of Joint Width: Not more than [1/16 inch (1.6 mm)][1/32 inch (0.79 mm)]<Insert dimension> wide from [hairline][reveal line] in 48 inches (1200 mm), noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 54 00 00B



Task	Specification	Specification Description
09 54 16 00	09 54 00 00	Suspended Wood Ceilings
09 54 16 00	09 54 00 00a	Stretched-Fabric Ceiling Systems
09 54 16 00	09 54 00 00b	Fabric-Wrapped Ceiling Panels



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SECTION 09 54 23 00 - LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linear metal ceilings.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 COORDINATION

- A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. **<Insert participant requirements>**.

1.7 ACTION SUBMITTALS

- A. Product Data: For linear metal ceilings.

- B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
3. Product Data: For adhesives, indicating VOC content.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting

materials.

- C. Shop Drawings: For linear metal ceilings.
 - 1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:
 - a. Linear ceiling patterns and joints.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - e. Ceiling perimeter and penetrations through ceiling; trim and moldings.
- D. Samples: For each exposed product and for each type, color, and finish specified, **12 inches (305 mm)** long in size.
- E. Samples for Initial Selection: For units with factory-applied colors and finishes.
 - 1. Include Samples of accessories involving color and finish selections.
- F. Samples for Verification: For the following products:
 - 1. Linear Metal Pans: **12 inches (305 mm)** long by full-width Samples of each type, color, and finish and a **12-inch- (305-mm-)** long spliced section.
 - 2. Suspension-System Members: **12-inch- (305-mm-)** long Sample of each type.
 - 3. Exposed Molding and Trim: **12-inch- (305-mm-)** long Samples of each type, color, and finish.
 - 4. Filler Strips: **12-inch- (305-mm-)** long Samples of each type, color, and finish.
 - 5. Sound Absorbers: **12 inches (305 mm)** long by full width.
 - 6. End Caps: Full size.
- G. Delegated Design Submittals: For design of[**seismic restraints and**] attachment devices.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each linear metal ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For linear-metal-ceiling framing systems.
- D. Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Linear-Metal-Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to [2]<Insert number> percent of quantity installed.

1.11 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program for testing indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 1. Build mockup of each type of linear metal ceiling as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- D. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- F. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle ceiling components and accessories in a manner that prevents damage.

1.13 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to design [seismic restraints and]attachment devices.

- B. Structural Performance: Exterior linear metal ceilings to withstand exterior exposure, the effects of gravity loads, and the following loads and stresses without showing permanent deformation of ceiling system components, including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:
 - 1. Wind Load: Uniform pressure [**indicated on Drawings**]**<Insert requirements>**, acting inward or outward.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces**]**<Insert requirements>**.
- D. Seismic Criteria: Provide linear metal ceilings designed and installed to withstand the effects of earthquake motions in accordance with [**ASTM E580/E580M**][**CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings - Seismic Zones 0-2"**][**CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4"**][**ASCE/SEI 7**]**<Insert requirements>** and requirements of authorities having jurisdiction.
- E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]**<Insert value>** percent.

2.2 LINEAR METAL CEILINGS

- A. Pans and Suspension System:
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [**American Decorative Ceilings, Inc.**]
 - b. [**Armstrong Ceiling & Wall Solutions**]
 - c. [**B+N Industries, Inc.**]
 - d. [**Rockfon; ROCKWOOL International**]
 - e. [**USG Corporation**]
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [**American Decorative Ceilings, Inc.**]
 - b. [**Armstrong Ceiling & Wall Solutions**]
 - c. [**B+N Industries, Inc.**]
 - d. [**Rockfon; ROCKWOOL International**]
 - e. [**USG Corporation**]
 - f. **<Insert manufacturer's name>**
- B. Metal Pans: Complying with ASTM E1264 for [**Type XIII**][**Type XX**] and formed to snap on to carriers securely, without separate fasteners.
 - 1. Surface-Burning Characteristics: For metal-pan assemblies, including backings, determined by testing in accordance with ASTM E84 by a qualified testing agency. Identify products with

appropriate markings of applicable testing agency.

- a. Flame-Spread Index: **[25]<Insert value> or less.**
 - b. Smoke-Developed Index: **[50][55]<Insert value> or less.**
2. Metal: **[Aluminum sheet, ASTM B209 (ASTM B209M), alloy and temper recommended by producer and finisher for type of use and finish indicated][Electrolytic zinc-coated steel sheet, ASTM A879/A879M, 04Z (12G) coating; surface treatment as recommended by finish manufacturer for type of use and painted finish indicated]<Insert requirements>.**
 3. Form: **[Perforated][Nonperforated].**
 - a. Perforation Pattern: **[As indicated by manufacturers designation]<Insert requirements>.**
 4. Noise Reduction Coefficient (NRC) Rating: Not less than **[0.70][0.75][0.85][1.00]<Insert requirements>** when tested in accordance with ASTM C423.
 5. Backing: **[Manufacturer's standard to provide NRC rating indicated for perforation pattern indicated][Nonwoven black fabric][Nonwoven black fabric with 1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene][1-inch- (25-mm-) thick glass fiber, 1 lb/cu. ft. (16 kg/cu. m) density, enclosed in black polyethylene]<Insert requirements>.**
 6. Pan Thickness: Not less than **[0.020 inch (0.51 mm)][0.025 inch (0.64 mm)][0.028 inch (0.71 mm)][0.040 inch (1.02 mm)]<Insert dimension>.**
 7. Pan Edge Detail: **[Beveled][Square][Round][Manufacturer's standard].**
 8. Pan Width: **[2-inch (51-mm) module width and 1-1/4-inch (32-mm) face width][4-inch (102-mm) module width and 3-1/4-inch (83-mm) face width][6-inch (152-mm) module width and 5-1/4-inch (133-mm) face width][8-inch (203-mm) module width and 7-1/4-inch (184-mm) face width][As indicated on Drawings]<Insert dimensions>.**
 9. Pan Depth: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][As indicated on Drawings]<Insert dimension>.**
 10. Metal-Pan Finish: Protected on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping and as follows:
 - a. Aluminum Anodic Finish: **[Clear finish, AAMA 611, AMP 500 AA-M12C22A31, Class II, 0.010 mm or thicker][Clear, mirror finish, AMP 500 AA-M21C12A212, 0.005 mm or thicker]<Insert requirements>.**
 - b. Color-Coated Finish: Manufacturer's standard **[powder-coat]** baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.
 - 1) Color and Pattern: **[As selected by Architect from manufacturer's full range][Match Architect's sample][As indicated by manufacturer's product designation]<Insert requirements>.**
 - 2) Light Reflectance (LR) Coefficient: Not less than **[0.61][0.77][0.81]<Insert value>** LR when tested in accordance with ASTM E1477.
 - c. Laminated-Film Finish: Provide **[manufacturer's standard][vinyl][PVC-free]<Insert requirements>** film permanently bonded to metal pan with adhesive.
 - 1) Color and Pattern: **[As selected by Architect from manufacturer's full range][Match Architect's sample][As indicated by manufacturer's product designation]<Insert requirements>.**
 - d. Wood-Veneer Finish: **[Match Architect's sample][As indicated by manufacturer's product designation][Wood veneer in species and finish selected by Architect from manufacturer's full range]<Insert requirements>**; permanently bonded to metal pan with

- adhesive.
- e. Finish Bonding Adhesive: Manufacturer's standard that permanently bonds finish to aluminum.
 - C. Certified Wood: Wood products shall be certified as "FSC Pure"[or **"FSC Mixed Credit"**] according to FSC STD-01-00 and FSC STD-40-004.
 - D. Certified Wood: Wood products shall be certified as "FSC Pure"[or **"FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
 - E. Certified Wood: Wood products shall be labeled according to the AFPA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
 - F. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "Technical Barriers to Trade."
 - G. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AFPA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 - H. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - I. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - J. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - K. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - L. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - M. Pan Splices: Formed for snap fit into butt-cut pans, **[4 inches (102 mm)][8 to 12 inches (203 to 305 mm)]<Insert dimension>** long.
 - 1. Finish: **[Manufacturer's standard][Matte black][Matching pan]<Insert requirements>**.
 - N. End Caps: Manufacturer's standard material fabricated to fit and conceal exposed ends of pans.
 - 1. Finish: **[Manufacturer's standard][Matte black][Matching pan]<Insert requirements>**.
 - O. Filler Strips: Manufacturer's standard, fabricated to close voids between pans.
 - 1. Type: **[Recessed][Flush][Integral extension of pan profile][Expansion, for use with expansion carriers][Slotted, for air diffusion]<Insert requirements>**.
 - 2. Finish: **[Manufacturer's standard][Matte black][Matching pan]<Insert requirements>**.
 - P. Moldings and Trim: Manufacturer's standard for exposed members, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at

changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.
- Q. Carrier Suspension System: Manufacturer's standard complying with requirements in ASTM C635/C635M for applications indicated; complete with carriers, splice sections, stabilizing components, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.
1. Material: **[ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 (Z180) coating designation][ASTM A879/A879M, electrolytic zinc-coated, cold-rolled steel, 08Z (24G) coating designation][ASTM B209 (ASTM B209M) aluminum]<Insert requirements>**.
 2. Structural Classification: **[Heavy-duty]<Insert requirements>** system.
 3. Adaptable Carriers: Manufacturer's standard carriers for direct attachment to existing suspended tees.
 4. Flexible Radial Carriers: Manufacturer's standard radial carriers.
 5. Expansion Carriers: Manufacturer's standard carriers allowing for irregularities or other unusual space conditions.
 6. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers.
 7. Carrier Splices: Same metal, profile, and finish as for carriers.
 8. Hold-Down Clips: Manufacturer's standard hold-down clips spaced as standard with manufacturer.
 9. Carrier Finish: **[Flat black]<Insert requirements>**.

2.3 CARRIER-SYSTEM HANGERS, BRACES, AND TIES

- A. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
1. Cast-in-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **[5]<Insert safety factor>** times that imposed by ceiling construction as determined by testing in accordance with ASTM E488/E488M or ASTM E1512, as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: **[Cast-in-place][Postinstalled expansion][Postinstalled bonded]** anchors.
 - b. Corrosion Protection:
 - 1) Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
 - 2) Stainless steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchors.
 - 3) Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **[10]<Insert safety factor>** times that imposed by ceiling construction as determined by testing in accordance with ASTM E1190 conducted by a qualified testing and inspecting agency.

- B. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
 4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung is less than yield stress of wire, but provides not less than **[0.106-inch- (2.69-mm-)] [0.135-inch- (3.5-mm-)] <Insert dimension>** diameter wire.
- C. Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than **7/8 inch (22 mm)** wide; formed from **0.04-inch- (1.0-mm-)** thick, galvanized-steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation; with bolted connections and **5/16-inch- (8-mm-)** diameter bolts.
- E. Seismic Struts: Suspension-system manufacturer's standard compression struts designed to accommodate seismic forces.
- F. Exterior Bracing: Cold-rolled steel channels and angles, hot-dip galvanized to comply with ASTM A653/A653M, **G60 (Z180)** coating designation; size and profile as required to withstand wind load.

2.4 ACCESSORIES

- A. Access Panels: For access at locations indicated, provide door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors permitting upward or downward opening.
1. Size: **[As indicated on Drawings] [24 inches (610 mm) square] <Insert requirements>**.
- B. Air-Distribution Devices: Where indicated on Drawings, provide independently suspended air-distribution devices that are relocatable and adjustable from below finished ceiling, that do not interrupt ceiling components, and that are fully concealed by and integrated with ceiling system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of linear metal pans.
1. Balance border widths at opposite edges of each ceiling.
 2. Avoid using less-than-half-width pans at borders.

3.3 INSTALLATION OF LINEAR METAL CEILINGS

- A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in **3 inches (76 mm)**. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts[, **power-actuated fasteners**,] or postinstalled mechanical or adhesive anchors that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than **48 inches (1219 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (203 mm)** from ends of each member.
 - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns in **1-1/2 inches (38 mm)**. Suspend bracing from building's structural members as required for hangers and without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.
 - 1. Screw attach moldings to substrate at intervals of not more than **16 inches (406 mm)** o.c. and not more than **3 inches (76 mm)** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.7 m)**. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system carriers so they are aligned and securely interlocked with one another.
 - 1. Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.
 - 2. Remove and replace dented, bent, or kinked members.

- F. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness.
- G. Install linear metal pans in coordination with suspension system and exposed moldings and trim.
 - 1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated on Drawings.
 - 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
 - a. Install pans with butt joints **[aligned][aligned, every other pan length][staggered a minimum of 12 inches (305 mm)][randomly aligned][aligned as indicated on Drawings]<Insert requirements>** using internal pan splices.
 - 3. Install directionally textured or patterned metal pans in directions indicated.
 - 4. Where metal pan ends are visible, install end caps unless trim is indicated.
 - 5. Install filler strips where indicated **[on Drawings]<Insert requirements>**.
 - 6. Install sound-absorbent pads at right angle to perforated metal pans so pads do not hang unsupported.
- H. Install hold-down clips where indicated.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage][Engage]** a qualified special inspector to perform the following special inspections:
 - 1. Suspended ceiling system.
 - 2. Hangers, anchors, and fasteners.
 - 3. **<Insert special inspections>**.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections: Testing and inspecting of completed installations of linear metal ceiling hangers, anchors, and fasteners to take place in successive stages, in test areas and using methods as follows. Do not proceed with installations of linear metal ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before pans have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for **200 lbf (890 N)** of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for **440 lbf (1957 N)** of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Linear metal ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings, after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 09 54 23 00



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Task	Specification	Specification Description
09 54 23 00	09 51 33 00	Acoustical Metal Pan Ceilings
09 54 23 00	09 54 00 00	Suspended Wood Ceilings
09 54 23 00	09 54 00 00a	Stretched-Fabric Ceiling Systems
09 54 23 00	09 54 00 00b	Fabric-Wrapped Ceiling Panels



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SECTION 09 57 00 00 - SECURITY CEILING ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Downward-locking-panel security ceiling assembly.
2. Security-plank security ceiling assembly.

1.2 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by Detention Specialist or other entity.
- B. Coordinate layout and installation of security ceiling assemblies with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Downward-locking-panel security ceiling assembly.
2. Security-plank security ceiling assembly.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For sealants, indicating VOC content.
3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
4. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
5. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
6. Environmental Product Declaration: For each product.
7. Health Product Declaration: For each product.
8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
9. Environmental Product Declaration: For each product.

10. Environmental Product Declaration: For each product.
11. Environmental Product Declaration: For each product.
12. Third-Party Certifications: For each product.
13. Third-Party Certified Life Cycle Assessment: For each product.

C. Samples for Verification: For the following products, of sizes indicated below:

1. Security Ceiling Panel Units: Full cross section by **12 inches (305 mm)** long for each type of panel.
2. Perimeter Supports, Closures, and Exposed Molding: **12 inches (305 mm)** long for each type.
3. Suspension System: **12 inches (305 mm)** long.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Layout of panels, joint pattern, and transitions.
 2. Suspension system members.
 3. Method of attaching hangers to building structure.
 4. Size and location of access panels.
 5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Product Test Reports: For each security ceiling assembly, for tests performed by a qualified testing agency.
- E. Attachment Device Test Reports: Indicating capability to sustain, without failure, load indicated without pulling out from substrate.
- F. Evaluation Reports: For security ceiling assembly, from **<Insert applicable model code organization>**.
- G. Field quality-control reports.
- H. Examination reports documenting inspection of substrates, areas, and conditions.
- I. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- J. Field quality-control certification signed by Contractor[**and Detention Specialist**].

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Security Ceiling Panels: Full-size units equal to **[2]<Insert number>** percent of amount installed.
 2. Suspension System Components: Quantity of each grid and exposed component equal to **[2]<Insert number>** percent of amount installed.

3. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed.
4. Tools: Provide **[two]<Insert number>** sets of tools for installing and removing security fasteners, packaged for easy handling and storage.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 4. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate security performance and aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockup **[48 by 48 inches (1220 by 1220 mm) square][of size equal to one cell]<Insert size>** of each type of security ceiling assembly. Include ceiling panels, suspension system, perimeter support, **[lighting unit],[duct penetration],[access panel,]** and accessories.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver security ceiling panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle security ceiling panels, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Security ceiling assemblies to withstand normal thermal movement and structural loads without failure, including permanent deformation of security ceiling assembly components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of security ceiling units; and permanent damage to fasteners and anchors.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.

- D. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- E. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- F. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Acoustical Performance: Provide security ceiling assemblies with acoustical ratings indicated, as determined in accordance with ASTM E1264 and the following:
 - 1. Noise Reduction Coefficient (NRC): ASTM C423 and ASTM E795 in Type E-400 mounting.
 - 2. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M.
 - a. Structural Performance: Security ceiling assemblies to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 3. Vertical Load for Security Ceiling Assemblies: **<Insert load>**, acting upward or downward.
 - 4. Live Load for Security Ceiling Assemblies: Panel dead weight plus a uniform load of **<Insert load>**, acting upward or downward, with a deflection not more than L/360.
 - 5. Wind Loads: As indicated on Drawings.
- I. Seismic Standard: Provide ceilings designed and installed to withstand the effects of earthquake motions in accordance with **[ASCE/SEI 7]<Insert requirement of authorities having jurisdiction>**.

2.2 DOWNWARD-LOCKING-PANEL SECURITY CEILING ASSEMBLY

- A. Downward-Locking-Panel Security Ceiling Assembly: Provide a complete, integrated assembly, including security ceiling panels, exposed suspension system, perimeter supports, and accessories.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[Gordon Inc.]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[Gordon Inc.]**
 - c. **<Insert manufacturer's name>**

- B. Panels: Fabricated from a single sheet of metal, with formed upturned edges on all four sides designed to continuously engage with and lock under rectangular bulb of suspension system.
1. Steel Panels: Metallic-coated steel with minimum uncoated sheet thickness of [0.043 inch (1.09 mm)][0.033 inch (0.84 mm)][0.021 inch (0.53 mm)].
 2. Aluminum Panels: Nominal sheet thickness of [0.040 inch (1.0 mm)][0.063 inch (1.60 mm)].
 3. Stainless Steel Panels: Nominal sheet thickness of [0.050 inch (1.27 mm)][0.025 inch (0.65 mm)].
 4. Panel Size: [12 by 24 inches (305 by 610 mm)][12 by 48 inches (305 by 1220 mm)][24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)].
 5. Perforation Pattern: [Manufacturer's standard][Unperforated]<Insert pattern>.
 6. Noise Reduction Coefficient (NRC): [0.70][0.80][0.85][0.90][0.95][1.00].
- C. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling panels.
1. Spacer Grids: [Metallic-coated steel][Aluminum] grid units that provide an air cushion between security ceiling panels and sound-absorptive pads and that act to improve sound absorption.
 2. Support Clips: Metal clips designed to hold sound-absorptive pads above bottom face sheet.
- D. Backer Plates: Unperforated units formed from [metallic-coated steel][aluminum] sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:
1. Ceiling Attenuation Class (CAC): [40][45]<Insert CAC rating>.
 2. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.
- E. Access Panels: Material, perforation pattern, and finish same as security ceiling panels; designed for installation by [continuously welding access panel frame to security ceiling panel][security fasteners screwed through suspension system]. Provide panels at [locations indicated on Drawings]<Insert location>.
1. Size: [24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][As indicated on Drawings].
 2. Lock Preparation: Prepare door panel to accept cylinder specified in [Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."] [Section 119814 "Detention Door Hardware."]
- F. Suspension System: ASTM C635/C635M, heavy-duty exposed system consisting of snap-in main runners supported by hangers attached to building structure.
1. Provide system complete with main runners, splice plates, connector and alignment clips, hangers, trim, seismic- and wind-load clips and struts, and other suspension components required to support security ceiling units and other security ceiling-supported construction.
 2. Main Runners and Cross Tees: Formed from metal sheet, 1-1/2 inches (38 mm) high, with 15/16-inch (23.8-mm) flange width and with oversized rectangular bulb for engaging panels.
 - a. Material: [Galvanized steel, G90 (Z275) zinc coating][Electrolytic zinc-coated steel, 40Z (12G) zinc coating][Aluminum][Stainless steel].
 3. Wire Hangers, Braces, and Ties: Zinc-coated, carbon-steel wire, ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - a. Size: Select wire diameter so its stress at [3]<Insert safety factor> times the hanger design load (ASTM C635/C635M, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

4. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
 5. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
 6. Angle Hangers: Angles with legs not less than **7/8 inch (22 mm)** wide, formed with **0.04-inch- (1.0-mm-) thick, galvanized-steel sheet, G90 (Z275)** zinc coating, with bolted connections and **5/16-inch- (8-mm-) diameter bolts**.
 7. Compression Struts: Fabricated from **3/4-inch- (19-mm-) diameter steel tubing**, designed to fit over rectangular bulb of suspension system.
 8. Security Clips: Steel wire, designed to slip over suspension system and through holes in flanges of panel to prevent panel removal.
- G. Perimeter Supports: Wall-mounted channel moldings and wall angles; fabricated from **[0.042-inch- (1.06-mm-) thick galvanized steel][0.016-inch- (0.4-mm-) thick galvanized steel][0.040-inch- (1.0-mm-) thick aluminum][0.050-inch- (1.3-mm-) thick stainless steel]**; finished to match suspension system.
- H. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions; of metal and finish matching security ceiling panels.
- I. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; **[uncoated][or][electrolytic zinc coated]** suitable for exposed applications.
 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
 3. Steel Tubing: ASTM A513/A513M, Type B.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
 5. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
 6. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**.

2.3 SECURITY-PLANK SECURITY CEILING ASSEMBLY

- A. Single-Configuration Panels: Fabricated from a single sheet of metal, with a self-locking male/female lap joint for joining panels.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[Detention Device Systems (DDS); DDS Group]**
 - c. **[Eckel Industries Inc.]**
 - d. **[Gordon Inc.]**
 - e. **[Trussbilt, LLC]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Armstrong Ceiling & Wall Solutions]**
 - b. **[Detention Device Systems (DDS); DDS Group]**
 - c. **[Eckel Industries Inc.]**
 - d. **[Gordon Inc.]**
 - e. **[Trussbilt, LLC]**
 - f. **<Insert manufacturer's name>**
3. Steel Panels: **[Electrolytic zinc][Metallic]**-coated steel with minimum uncoated sheet thickness of **[0.097 inch (2.45 mm)][0.068 inch (1.72 mm)][0.053 inch (1.34 mm)][0.043 inch (1.09 mm)][0.033 inch (0.84 mm)]**.
 4. Aluminum Panels: Nominal sheet thickness of **[0.125 inch (3.2 mm)][0.100 inch (2.5 mm)][0.080 inch (2.0 mm)][0.063 inch (1.6 mm)][0.050 inch (1.2 mm)][0.040 inch (1.0 mm)]**.
 5. Stainless Steel Panels: Nominal sheet thickness of **[0.109 inch (2.78 mm)][0.078 inch (1.98 mm)][0.062 inch (1.59 mm)][0.050 inch (1.27 mm)]**.
 6. Panel Width: **[12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]**.
 7. Panel Length: **[Minimum 8 feet (2.4 m)][Minimum 10 feet (3.0 m)][Minimum 12 feet (3.7 m)][Custom lengths to fit areas indicated]**.
 8. Perforation Pattern: **[Manufacturer's standard][Unperforated]<Insert pattern>**.
 9. Noise Reduction Coefficient (NRC): **[0.70][0.80][0.85][0.90][0.95][1.00]**.
- B. Double-Configuration Panels: Factory-assembled units with cold-rolled steel top face sheet and metallic-coated steel bottom face sheet, welded to a truss core. Fabricate panels with a self-locking male/female lap joint for joining panels.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Habersham Metal Products Company]**
 - b. **[Trussbilt, LLC]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Habersham Metal Products Company]**
 - b. **[Trussbilt, LLC]**
 - c. **<Insert manufacturer's name>**
 3. Panel Width: **[12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]** wide by length indicated.
 4. Panel Length: **[Custom lengths to fit areas indicated]<Insert length>**.
 5. Overall Panel Thickness: As **[required by indicated spans][indicated on Drawings]**.
 6. Minimum Uncoated Top Face Sheet Thickness: **[0.068 inch (1.72 mm)][0.053 inch (1.34 mm)][0.043 inch (1.09 mm)][0.033 inch (0.84 mm)]**.
 7. Minimum Uncoated Bottom Face Sheet Thickness: **[0.068 inch (1.72 mm)][0.053 inch (1.34 mm)][0.043 inch (1.09 mm)][0.033 inch (0.84 mm)]**.
 8. Truss Core: Fabricated from **0.015-inch- (0.38-mm-)** thick, cold-rolled steel sheet bent into corrugated shape; welded to top and bottom face sheets at even spacings across and along length of panel.
 9. Perforation Pattern for Bottom Face Sheet: **[Manufacturer's standard][Unperforated]<Insert pattern>**.
 10. Noise Reduction Coefficient (NRC): **[0.65][0.90][1.00]**.

- C. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling planks.
1. Spacer Grids: **[Metallic-coated-steel][Aluminum]** grid units that provide an air cushion between security ceiling panels and sound-absorptive pads and that act to improve sound absorption.
 2. Support Clips: Metal clips designed to hold sound-absorptive pads above bottom face sheet.
- D. Backer Plates: Unperforated units formed from **[metallic-coated steel][aluminum]** sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:
1. Ceiling Attenuation Class (CAC): **[40][45]<Insert CAC rating>**.
 2. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.
- E. Access Panels: Material, perforation pattern, and finish same as security ceiling panels; designed for installation by **[continuously welding access panel frame to security ceiling panel][security fasteners screwed through suspension system]**. Provide at **[locations indicated on Drawings]<Insert location>**.
1. Size: **[24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1220 mm)][As indicated]**.
 2. Lock Preparation: Prepare door panel to accept cylinder specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]****[Section 119814 "Detention Door Hardware."]**
- F. Closures: Fabricated from minimum **0.053-inch- (1.34-mm-)** thick steel sheet, finished to match security ceiling panels. Fasten with security fasteners or by welding.
- G. Suspension System: Heavy-duty exposed system consisting of intermediate carriers supported by secondary support system attached to building structure.
1. Intermediate Carriers: Formed from tees with a nominal **4-inch- (102-mm-)** wide exposed face or built up from back-to-back angles or channels each with a nominal **2-inch- (51-mm-)** wide exposed face.
 - a. Steel Intermediate Carriers: **[Electrolytic zinc][Metallic]**-coated steel with minimum uncoated sheet thickness of **[0.097 inch (2.45 mm)][0.068 inch (1.72 mm)][0.053 inch (1.34 mm)][0.043 inch (1.09 mm)]**, finished to match security ceiling panels.
 - b. Aluminum Intermediate Carriers: Nominal sheet thickness of **[0.125 inch (3.2 mm)][0.100 inch (2.5 mm)][0.080 inch (2.0 mm)][0.063 inch (1.6 mm)][0.050 inch (1.2 mm)][0.040 inch (1.0 mm)]**, finished to match security ceiling panels.
 - c. Stainless Steel Intermediate Carriers: Nominal sheet thickness of **[0.141 inch (3.6 mm)][0.109 inch (2.8 mm)][0.078 inch (2.0 mm)][0.063 inch (1.6 mm)]**, finished to match security ceiling panels.
 2. Secondary Support System:
 - a. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
 - b. Angle Hangers: **1-1/2-by-1-1/2-inch (38-by-38-mm)** galvanized-steel angles, **G90 (Z275)** zinc coating, bolted to intermediate carriers and building structure.
- H. Perimeter Supports: Wall-mounted angles, tees, and bearing plates.
1. Steel Perimeter Supports: **[Electrolytic zinc][Metallic]**-coated steel with minimum uncoated sheet thickness of **[0.167 inch (4.20 mm)][0.097 inch (2.45 mm)][0.068 inch (1.72 mm)][0.053 inch (1.34 mm)][0.043 inch (1.09 mm)]**, finished to match security ceiling panels.
 2. Aluminum Perimeter Supports: Nominal sheet thickness of **[0.125 inch (3.2 mm)][0.100 inch (2.5**

- mm)][0.080 inch (2.0 mm)][0.063 inch (1.6 mm)][0.050 inch (1.2 mm)][0.040 inch (1.0 mm)], finished to match security ceiling panels.
3. Stainless Steel Perimeter Supports: Nominal sheet thickness of [0.141 inch (3.6 mm)][0.109 inch (2.8 mm)][0.078 inch (2.0 mm)][0.063 inch (1.6 mm)], finished to match security ceiling panels.
 - I. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions, of metal and finish matching security ceiling panels.
 - J. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; [uncoated][or][electrolytic zinc coated] suitable for exposed applications.
 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
 3. Steel Tubing: ASTM A513/A513M, Type B.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, [Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>.
 5. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
 6. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**.

2.4 SOUND-ABSORPTIVE PADS

- A. Plastic-Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, vinyl chloride plastic sheet encapsulating unfaced mineral-fiber insulation.
 1. Plastic Sheet: Not less than **0.003 inch (0.076 mm)** thick; flat black.
 2. Mineral Fiber: Glass fiber or fiber made from slag (mineral wool), complying with ASTM C553, Type I, II, or III.
 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- B. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less, except for insulation manufactured without formaldehyde.
- E. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 1. Thickness: [1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][4 inches (102 mm)][As required to meet NRC rating].
 2. Mineral-Fiber Density: [1.0 lb/cu. ft. (16 kg/cu. m)][1.5 lb/cu. ft. (24 kg/cu. m)][As required to meet NRC rating].

3. Surface-Burning Characteristics: As determined by testing identical products in accordance with ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **[25]<Insert value>** or less.
 - b. Smoke-Developed Index: **[50][450]<Insert value>** or less.

2.5 FABRICATION

- A. Panels: Form metal panels from sheet metals selected for their surface flatness, smoothness, and freedom from surface blemishes where exposed to view in finished unit. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled metal sheet.
 1. Security Planks: Factory fabricate double-configuration security planks and join top and bottom face sheets by continuous weld over entire length of panel edge joints.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: **[Manufacturer's standard white]<Insert color and gloss>**.

2.8 METALLIC-COATED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the coating to be applied over it.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**

2.9 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with **[SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"]****[or]****[SSPC-SP 8, "Pickling"]****<Insert surface preparation method>.** **[After cleaning, apply a conversion coating suited to the organic coating to be applied over it.]**
- B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.

1. Color and Gloss: **[Manufacturer's standard white]****<Insert color and gloss>.**

2.10 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run grain of directional finishes with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 3. Directional Satin Finish: No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

2.11 SECURITY FASTENERS

- A. Security Fasteners for Ceiling Assemblies: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
3. Drive-System Type: **[Pinned Torx-Plus][Pinned Torx]<Insert system>**.
 4. Fastener Strength: **120,000 psi (827 MPa)**.
 5. Socket Button Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 6. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 7. Socket Head Cap Fasteners:
 - a. Heat-treated alloy steel, ASTM A574.
 - b. Stainless steel, **ASTM F837 (ASTM F837M)**, Group 1 CW.
 8. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.12 SECURITY SEALANTS

- A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Master Builders Solutions]**
 - b. **[Pecora Corporation]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Master Builders Solutions]**
 - b. **[Pecora Corporation]**
 - c. **<Insert manufacturer's name>**

3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- B. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**
 3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- C. Acoustical Sealant: Manufacturer's standard, nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Pecora Corporation]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Pecora Corporation]**
 - b. **[USG Corporation]**
 - c. **<Insert manufacturer's name>**
 3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.13 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welding.

- C. Attachment Devices: Size for **[five]<Insert safety factor>** times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security ceiling assemblies.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security ceiling assembly connections before security ceiling assembly installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security ceiling assemblies.
- D. Inspect built-in and cast-in anchor installations before installing security ceiling assemblies to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Repair, or remove and replace, anchors where inspections indicate noncompliance with specified requirements. Reinspect after repair or replacement.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Verify locations and layouts of security ceiling assemblies with those indicated on reflected ceiling plans and coordination drawings.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each security ceiling area and establish layout of security ceiling panels to balance border widths at opposite edges of each security ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans and coordination drawings.

3.3 GENERAL INSTALLATION

- A. Comply with Cisca's "Ceiling Systems Handbook" for installation of security ceiling assemblies.
- B. Install perimeter supports around perimeter of security ceiling area.

1. Sealant: Apply **[polyurethane security][epoxy security][acoustical]** sealant in a continuous ribbon concealed on back of vertical legs of supports before they are installed.
2. Attach supports with anchor bolts or expansion anchors spaced not more than **12 inches (305 mm)** o.c. and not more than **3 inches (76 mm)** from ends. Miter corners accurately.
 - a. Level perimeter supports with suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.7 m)**.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim. If exposed fasteners are unavoidable, obtain prior written approval from Architect for their use and use security fasteners.

C. Install accessories where indicated and as required to comply with performance requirements.

1. Sound-Absorptive Pads: For security ceiling panels indicated, provide sound-absorptive pads of width and length to completely fill inside of each security ceiling panel.
 - a. Install sound-absorptive pads **[over metal spacer grids][with support clips]**.
2. Backer Plates: Install plates in areas indicated on reflected ceiling plans or in room finish schedules. Lay backer plates directly on security ceiling assembly in manner indicated and close major openings to form complete coverage in required areas. **[Lay second sound-absorptive pad on backer plate.]**

D. Seismic Installation: Comply with seismic standard indicated, manufacturer's written instructions, and Cisca's "Ceiling Systems Handbook."

3.4 INSTALLATION OF DOWNWARD-LOCKING-PANEL SECURITY CEILING ASSEMBLY

A. Ceiling Hangers: Suspend from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within security ceiling plenum that are not part of supporting structure or of security ceiling suspension system.
2. Splay hangers only where required to avoid obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to security ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support security ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts or postinstalled mechanical or adhesive anchors.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than **48 inches (1220 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 11. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
 12. Install compression struts extending from main runners to structure above and spaced at **48 inches (1220 mm)** o.c.
- B. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- C. Panel Installation: Install panels to continuously engage with and lock under rectangular bulb of suspension system. Attach panels to perimeter supports with security fasteners not more than **3 inches (76 mm)** from edges of panel. Fasten through exposed face of supports into panel.
1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating security ceiling.
 3. Install directionally patterned panels in directions indicated.
 4. Scribe and cut security ceiling panels for accurate fit at borders and at interruptions and penetrations by other work through security ceilings. Stiffen edges of cut panels as required to eliminate evidence of buckling or variations in flatness.
- D. Access Panels: Install each access panel only where indicated and within one security ceiling panel.

3.5 INSTALLATION OF SECURITY-PLANK SECURITY CEILING ASSEMBLY

- A. Install security planks with long edges continuously interlocked. Adjust security planks to final position before permanently fastening. Provide minimum **1-1/2-inch (38-mm)** end bearing.
1. Attach adjacent security planks to each other with security fasteners spaced not more than **12 inches (305 mm)** o.c. and not more than **6 inches (152 mm)** from ends.
 2. Continuously weld ends of security planks to perimeter supports. Remove exposed projecting burrs, edges, and rough spots resulting from welding operations by grinding smooth.
 3. Attach ends of security planks to perimeter supports with security fasteners not more than **3 inches (76 mm)** from edges of security plank. Fasten through exposed face of supports into security planks.
 4. Provide intermediate carriers for ends of security planks that are not supported by perimeter supports. To attach security planks to intermediate carriers, use same method as that used for attaching security planks to perimeter supports.
 - a. Support intermediate carriers from structure above by secondary support system spaced at **48 inches (1220 mm)** o.c. and bolted to carriers.
- B. Access Panels: Install each access panel only where indicated and within one security plank.
- C. Provide steel angle reinforcement on each side of openings that exceed **12 inches (305 mm)** in any direction.

3.6 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.



- B. Remove and replace security ceiling assemblies where inspections indicate that work does not comply with specified requirements.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification[**endorsed by Detention Specialist**] that states installed products and their installation comply with requirements in the Contract Documents.
- E. Field Quality-Control Testing: [**Owner will engage**][**Engage**] a qualified independent testing agency to perform field quality-control testing.
- F. Extent and Testing Frequency: Testing will take place in successive stages in areas described below. Proceed with installation of security ceiling assemblies only after test results for previously installed hangers comply with requirements.
 - 1. Extent of Each Test Area: When installation of security ceiling suspension systems on each floor has reached 20 percent completion, but no security panel units have been installed.
 - 2. Within each test area, testing agency will select 1 of every 10 anchors used to attach hangers to concrete and will test them for **200 lbf (890 N)** of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for **440 lbf (1957 N)** of tension.
 - 3. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those fasteners and anchors not previously tested until 20 consecutively pass and then will resume initial testing frequency.
- G. Fasteners and anchors will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
- I. Additional Testing: Where fasteners and anchors are removed and replaced, additional testing will be performed to determine compliance with specified requirements.

3.7 CLEANING

- A. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.
- B. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as that used for shop painting; comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Metallic-Coated Steel Surfaces: Clean field welds, bolted connections, and abraded areas and repair zinc or zinc-iron coating to comply with ASTM A780/A780M.



END OF SECTION 09 57 00 00



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Task	Specification	Specification Description
09 57 63 00	09 57 00 00	Security Ceiling Assemblies



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SECTION 09 63 13 00 - BRICK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brick flooring set on thickset mortar bed.
2. Brick flooring set in thinset mortar directly on concrete.

B. Related Requirements:

1. **[Section 071326 "Self-Adhering Sheet Waterproofing"]****[Section 071353 "Elastomeric Sheet Waterproofing"]****[Section 071354 "Thermoplastic Sheet Waterproofing"]****[Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"]****[Section 071416 "Cold Fluid-Applied Waterproofing"]** for waterproofing under brick flooring.
2. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in brick flooring.
3. Section 096313.35 "Chemical-Resistant Brick Flooring" for brick flooring set with chemical-resistant materials.
4. Section 321400 "Unit Paving" for brick pavers installed in pavement applications (exterior) rather than as flooring (interior).

1.2 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference: Conduct conference at **[Project site]**<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For materials other than water and aggregates.
2. For the following:
 - a. Brick.
 - b. Packaged mortar mixes.
 - c. Packaged grout mixes.
 - d. Mortar and grout additives.
 - e. Sealer.
 - f. Floor polish.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
2. Environmental Product Declaration (EPD): For each product.
3. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means

- of transportation, and cost for each indigenous material.
- 4. Environmental Product Declaration: For each product.
- 5. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
- 6. Environmental Product Declaration: For each product.
- 7. Environmental Product Declaration: For each product.
- 8. Third-Party Certifications: For each product.
- 9. Third-Party Certified Life Cycle Assessment: For each product.
- 10. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of brick[**and for grout and accessories involving color selection**].

D. Samples for Verification: Full-size units of each type of brick[**with joints grouted and cured**].

- 1. Seal and polish Samples on one-half of exposed traffic surface.

1.4 INFORMATIONAL SUBMITTALS

A. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

- 1. Apply sealer and floor polish over one-half of mockup's traffic surface.
- 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, samples of flooring materials that will contact or affect mortar and grout that contain latex additives.

- 1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be nonstaining to, installed brick and other materials constituting brick flooring installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store bricks on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Deliver, store, and handle bricks that have temporary protective coating, with coated surfaces placed against other coated surfaces. Do not allow coated surfaces to come in contact with uncoated surfaces.

- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store aggregates where grading and other required characteristics can be maintained and where contamination can be avoided.
- E. Store liquids in tightly closed containers protected from freezing.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not set brick flooring when air temperature or material temperature is below **40 deg F (4.4 deg C)**. Maintain minimum ambient temperature of **40 deg F (4.4 deg C)** during installation and for 48 hours after completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of brick and joint material from single source from single manufacturer or producer.

2.2 BRICK PAVERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Acme Brick Company]**
2. **[Belden Brick Company (The)]**
3. **[Boral Bricks, Inc; Boral Limited]**
4. **[Endicott Clay Products Co]**
5. **[General Shale, Inc.]**
6. **[Glen-Gery Corporation]**
7. **[Hastings Pavement Company, LLC]**
8. **[I-XL Industries Ltd.]**
9. **[Interstate Brick; Basalite Concrete Products, LLC; Pacific Coast Building Products, Inc.]**
10. **[Pine Hall Brick Company]**
11. **[Redland Brick Inc.]**
12. **[Whitacre Greer Company]**
13. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Acme Brick Company]**
2. **[Belden Brick Company (The)]**
3. **[Boral Bricks, Inc; Boral Limited]**
4. **[Endicott Clay Products Co]**
5. **[General Shale, Inc.]**
6. **[Glen-Gery Corporation]**
7. **[Hastings Pavement Company, LLC]**
8. **[I-XL Industries Ltd.]**
9. **[Interstate Brick; Basalite Concrete Products, LLC; Pacific Coast Building Products, Inc.]**

10. [Pine Hall Brick Company]
11. [Redland Brick Inc.]
12. [Whitacre Greer Company]
13. <Insert manufacturer's name>

- C. Brick Pavers: Light-traffic paving brick complying with ASTM C902, [Class SX][Class MX][Class NX], [Type I][Type II][Type III], [Application PS][Application PX][Application PA], without frogs or cores in surfaces exposed to view in the completed Work.
- D. Regional Materials: Brick shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- E. Regional Materials: Brick shall be manufactured within **500 miles (800 km)** of Project site.
- F. Regional Materials: Brick shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- G. Indigenous Materials: Brick shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Regional Materials: Brick shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- I. Size: [As indicated.][Actual dimensions as follows:]
 1. Thickness: [1-1/4 inches (32 mm)][1-5/8 inches (41 mm)][2-1/4 inches (57 mm)].
 2. Face Dimensions: [3-5/8 by 7-5/8 inches (92 by 194 mm)][4 by 8 inches (102 by 203 mm)][3-5/8 by 11-5/8 inches (92 by 295 mm)][7-5/8 by 7-5/8 inches (194 by 194 mm)].
- J. Colors and Textures: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
- K. Temporary Protective Coating: Precoat exposed surfaces of brick pavers[**at factory**] with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces; handle brick to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

2.3 MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate: ASTM C144.

- D. Latex Additive: **[Manufacturer's standard][acrylic resin][or][styrene-butadiene-rubber]** water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
- E. Cleavage Membrane: Asphalt-saturated felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, **4.0 mils (0.1 mm)** thick.
- F. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, **2 by 2 inches (50.8 by 50.8 mm)** by **0.062 inch (1.57 mm)** in diameter; in compliance with ASTM A1064/A1064M.
- G. Thinset Mortar: Latex-portland-cement mortar complying with ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Jamo Inc]**
 - h. **[Laticrete International, Inc.]**
 - i. **[MAPEI Corporation]**
 - j. **[Parex, a Sika brand]**
 - k. **[ProSpec; H.B. Fuller Construction Products Inc.]**
 - l. **[Sakrete; CRH Americas, Oldcastle APG]**
 - m. **[Southern Grouts & Mortars, Inc]**
 - n. **[Summitville Tiles, Inc.]**
 - o. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Jamo Inc]**
 - h. **[Laticrete International, Inc.]**
 - i. **[MAPEI Corporation]**
 - j. **[Parex, a Sika brand]**
 - k. **[ProSpec; H.B. Fuller Construction Products Inc.]**
 - l. **[Sakrete; CRH Americas, Oldcastle APG]**
 - m. **[Southern Grouts & Mortars, Inc]**
 - n. **[Summitville Tiles, Inc.]**
 - o. **<Insert manufacturer's name>**
 - 3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

4. Provide prepackaged, dry-mortar mix combined with **[acrylic resin][or][styrene-butadiene-rubber]** liquid-latex additive at Project site.
5. Provide product that is approved by manufacturer for application thickness of **[5/8 inch (16 mm)]<Insert value>**.

2.4 GROUT MATERIALS

- A. Sand-Portland-Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
 1. Colored Mortar Pigments for Grout: Natural and synthetic iron and chromium oxides, compounded for use in mortar and grout mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in portland-cement grout.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Davis Colors]**
 - 2) **[Lanxess Corporation]**
 - 3) **[Solomon Colors Inc.]**
 - 4) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Davis Colors]**
 - 2) **[Lanxess Corporation]**
 - 3) **[Solomon Colors Inc.]**
 - 4) **<Insert manufacturer's name>**
- B. Standard Cement Grout: ANSI A118.6, sanded.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Jamo Inc]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[ProSpec; H.B. Fuller Construction Products Inc.]**
 - k. **[Sakrete; CRH Americas, Oldcastle APG]**
 - l. **[Southern Grouts & Mortars, Inc]**
 - m. **[Summitville Tiles, Inc.]**
 - n. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Boiardi Products Corporation; a QEP company]**
 - b. **[Bostik; Arkema]**
 - c. **[C-Cure]**
 - d. **[Custom Building Products]**
 - e. **[H.B. Fuller Construction Products Inc. / TEC]**
 - f. **[Jamo Inc]**
 - g. **[Laticrete International, Inc.]**
 - h. **[MAPEI Corporation]**
 - i. **[Parex, a Sika brand]**
 - j. **[ProSpec; H.B. Fuller Construction Products Inc.]**
 - k. **[Sakrete; CRH Americas, Oldcastle APG]**
 - l. **[Southern Grouts & Mortars, Inc]**
 - m. **[Summitville Tiles, Inc.]**
 - n. **<Insert manufacturer's name>**

C. High-Performance Tile Grout: ANSI A118.7, sanded.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Jamo Inc]**
 - h. **[Laticrete International, Inc.]**
 - i. **[MAPEI Corporation]**
 - j. **[Sakrete; CRH Americas, Oldcastle APG]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARDEX Americas]**
 - b. **[Boiardi Products Corporation; a QEP company]**
 - c. **[Bostik; Arkema]**
 - d. **[C-Cure]**
 - e. **[Custom Building Products]**
 - f. **[H.B. Fuller Construction Products Inc. / TEC]**
 - g. **[Jamo Inc]**
 - h. **[Laticrete International, Inc.]**
 - i. **[MAPEI Corporation]**
 - j. **[Sakrete; CRH Americas, Oldcastle APG]**
 - k. **[Southern Grouts & Mortars, Inc]**
 - l. **[Summitville Tiles, Inc.]**

m. <Insert manufacturer's name>

3. Polymer Type:

- a. Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- b. **[Acrylic resin][or][styrene-butadiene rubber]** in liquid-latex form for addition to prepackaged dry-grout mix.

D. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.

E. Water: Potable.

2.5 MISCELLANEOUS MATERIALS

A. Expansion- and Control-Joint-Filler Strips: ASTM D1752, cork or self-expanding cork.

B. Sealer: Colorless, stain- and slip-resistant sealer, not affecting color or physical properties of brick and grout surfaces and specifically recommended by sealer manufacturer for use indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Custom Building Products]**
- b. **[Hillyard, Inc.]**
- c. **[HMK Stone Care System; ACI International]**
- d. **[Summitville Tiles, Inc.]**
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert **manufacturer's name; product name or designation**> or comparable product by one of the following:

- a. **[Custom Building Products]**
- b. **[Hillyard, Inc.]**
- c. **[HMK Stone Care System; ACI International]**
- d. **[Summitville Tiles, Inc.]**
- e. <Insert manufacturer's name>

- 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 4. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 5. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- 6. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from

7. Indoor Sources Using Environmental Chambers." Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Floor Polish: ASTM D4078, formulated for use over sealer indicated, acceptable to sealer manufacturer, and specifically recommended by floor-polish manufacturer for use indicated.
 1. Slip Resistance: Floor polish to have a static coefficient of friction of at least 0.5 when tested according to ASTM D2047.
 2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 5. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout when they have reached their initial set.
- B. Portland-Cement-Lime Setting-Bed Mortar: ASTM C270, **[Type S][Type N]**, Proportion Specification.
- C. Latex-Modified Portland-Cement Setting-Bed Mortar: Proportion and mix according to written instructions of liquid-latex manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive brick.
- D. Mortar-Bed Bond Coat: Mix neat cement and **[latex additive][water]** to a creamy consistency.
- E. Thinset Mortar Bond Coat: Proportion and mix according to manufacturer's written instructions.
- F. Portland-Cement Bond Coat: Mix neat cement and water to a creamy consistency.
- G. Thinset Mortar: Proportion and mix according to manufacturer's written instructions.
- H. Job-Mixed Grout: Proportion and mix portland cement and aggregate grout to match setting-bed mortar, except omit hydrated lime and use enough water to produce a pourable mixture.
 1. Pigmented Grout: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1 to 10, by weight.
 2. Colored-Aggregate Grout: Produce color required by combining colored aggregates with portland cement of selected color.

- I. Packaged Grout: Proportion and mix according to grout manufacturer's written instructions.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine surfaces indicated to receive brick flooring, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBFLOOR

- A. Sweep subfloor to remove dirt, dust, debris, and loose particles.
- B. Remove substances from subfloor that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

3.3 INSTALLATION, GENERAL

- A. Do not use bricks with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in the finished Work.
- B. Mix bricks from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut bricks with motor-driven masonry saw to provide clean, sharp, unchipped edges. Hammer cutting is not acceptable. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
- D. Joint Pattern: **[Running bond][Herringbone][Basket weave][As indicated][Match existing brick flooring joint pattern]**.
- E. Hand-Tight Joints: Set brick with hand-tight joints[**where indicated**].
- F. Spaced Joint Widths: Provide nominal **[3/8-inch (10-mm)][1/2-inch (13-mm)]** joint width with variations not exceeding plus or minus **[1/16 inch (1.6 mm)][1/8 inch (3 mm)][unless otherwise indicated]**.
- G. Finished-Surface Tolerances:
 - 1. Do not exceed **1/32-inch (1-mm)** brick-to-brick offset from flush (lippage) or **1/8 inch in 10 feet (3 mm in 3 m)** from level, or indicated slope, for finished surface of brick flooring.
 - 2. Do not exceed **1/16-inch (1.5-mm)** brick-to-brick offset from flush (lippage) nor **1/8 inch in 24 inches (3 mm in 600 mm)** and **1/4 inch in 10 feet (6 mm in 3 m)** from level, or indicated slope, for finished surface of brick flooring.
- H. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide joint filler as backing for sealant-filled joints where indicated. Install joint filler before setting brick flooring. Sealant materials and installation are specified in Section 079200 "Joint Sealants."

3.4 THICKSET BRICK FLOORING

- A. Apply mortar bed to concrete subfloors to comply with the following requirements:
1. Saturate concrete subfloor with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
 2. Apply mortar-bed bond coat over surface of concrete subfloor about 15 minutes before placing mortar bed. Do not exceed **1/16-inch (1.6-mm)** thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
 3. Place reinforcing wire fabric over mortar-bed bond coat, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of setting bed. Hold edges back from vertical surfaces approximately **1/2 inch (13 mm)**.
 4. Apply mortar bed immediately after applying mortar-bed bond coat. Spread and screed setting bed to uniform thickness at elevations required for accurate setting of brick to finished elevations indicated.
 5. Brick Wet Set on Workable Mortar Bed: Mix and place only that amount of mortar bed that can be covered with brick before initial set. Cut back, bevel edge, and discard setting-bed material that has reached initial set before placing brick.
 6. Brick Set on Cured Mortar Bed: Cure mortar bed for not less than 20 hours at **70 deg F (21 deg C)**.
- B. Apply mortar bed over **[cleavage membrane][waterproofing]** to comply with the following requirements:
1. Place cleavage membrane over subfloor surfaces indicated to receive brick flooring, lapped at least **4 inches (100 mm)** at joints.
 2. Place reinforcing wire fabric over membrane, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of setting bed. Hold edges back from vertical surfaces approximately **1/2 inch (13 mm)**.
 3. Place mortar bed over cleavage membrane with reinforcing wire fabric fully embedded in middle of setting bed. Spread and screed setting bed to uniform thickness at elevations required for accurate setting of brick to finished elevations indicated.
 4. Brick Wet Set on Workable Mortar Bed: Mix and place only that amount of mortar bed that can be covered with brick before initial set. Cut back, bevel edge, and discard setting-bed material that has reached initial set before placing brick.
 5. Brick Set on Cured Mortar Bed: Cure mortar bed for not less than 20 hours at **70 deg F (21 deg C)**.
- C. Install brick either in workable mortar bed or over cured mortar bed at Contractor's option.
- D. Install brick in workable mortar bed to comply with the following requirements:
1. Wet brick before laying if the initial rate of absorption exceeds **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested according to ASTM C67. Allow brick to absorb the water so it is damp but not wet at the time of laying.
 2. Place brick before initial set of mortar takes place. Immediately before placing brick on setting bed, apply uniform **1/16-inch- (1.6-mm-)** thick bond coat to mortar bed or to back of each brick with a flat trowel.
 3. Tamp or beat brick with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each brick in a single operation before initial set of mortar; do not return to areas already set and disturb bricks for purposes of realigning finished surfaces or adjusting joints.
- E. Install brick over cured mortar bed to comply with the following requirements:
1. Wet brick before laying if the initial rate of absorption exceeds **30 g/30 sq. in. (30 g/194 sq. cm)**

per minute when tested according to ASTM C67. Allow brick to absorb the water so it is damp but not wet at the time of laying.

2. Apply thinset mortar to setting bed with notched trowel complying with manufacturer's specifications for notch depth and configuration and in heavy enough layer to provide a minimum mortar-bed thickness of **3/32 to 1/8 inch (2.5 to 3 mm)** after bricks are fully embedded. Key the mortar into setting bed with flat side of trowel and comb with notched side of trowel in one direction. Apply only as much mortar as can be covered with brick before initial set (15 to 30 minutes).
3. Place brick while thinset mortar is still tacky and before initial set takes place. Immediately before placing brick on setting bed, apply skim coat of thinset mortar to back of brick. Place brick by sliding in direction perpendicular to combed ridges, and tamp or beat brick with a small beating block to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances; do not return to areas already set and disturb bricks for purposes of realigning finished surfaces or adjusting joints.

3.5 THINSET BRICK FLOORING

- A. Install brick flooring on concrete subfloor with thinset mortar to comply with the following requirements:
 1. Wet brick before laying if the initial rate of absorption exceeds **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested according to ASTM C67. Allow brick to absorb the water, so it is damp but not wet at the time of laying.
 2. Apply thinset mortar to subfloor with notched trowel complying with manufacturer's specifications for notch depth and configuration and in heavy enough layer to provide a minimum mortar-bed thickness of **3/32 to 1/8 inch (2.5 to 3 mm)** after bricks are fully embedded. Key the mortar into substrate with flat side of trowel and comb with notched side of trowel in one direction. Apply only as much mortar as can be covered with brick before initial set (15 to 30 minutes).
 3. Place brick while mortar is still tacky and before initial set takes place. Immediately before placing brick, apply skim coat of thinset mortar to back of brick. Place brick by sliding in direction perpendicular to combed ridges, and tamp or beat brick with a small beating block to obtain full contact with mortar and to bring finished surfaces within indicated tolerances; do not return to areas already set and disturb bricks for purposes of realigning finished surfaces or adjusting joints.

3.6 JOINT TREATMENT

- A. Hand-Tight Joints: Sweep dry mixture of portland cement and sand into joints, then fog surface with water to set mixture.
- B. Grouted Joints: Grout brick joints complying with ANSI A108.10.
- C. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining brick and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free from drying cracks.
- D. Cure grout by maintaining it in a damp condition for seven days unless otherwise recommended by grout manufacturer.
- E. Movement Joints: Provide expansion, control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and brick. Do not saw-cut joints after installing brick flooring. Keep joint free of mortar and other rigid materials.
 1. Where joints occur in concrete substrates, locate joints in brick flooring directly above them.

3.7 REPAIR, POINTING, CLEANING, AND PROTECTION

- A. Remove and replace bricks that are loose or damaged or that do not match other bricks. Provide new bricks to match adjoining bricks and install in same manner as original bricks, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess mortar and grout from exposed brick surfaces; wash and scrub clean.
 - 1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to brick and grout manufacturers. Trap and remove coating to prevent it from clogging drains.
- D. Sealing and Polishing: After floor has been cleaned and is thoroughly dry, seal and polish traffic surface of brick flooring in a manner that results in a clear, uniform appearance. Apply sealer and floor polish in the number of coats and by application methods that comply with written directions of manufacturer of each product. Do not apply floor polish until sealer has dried.

END OF SECTION 09 63 13 00



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SECTION 09 63 13 00A - CHEMICAL-RESISTANT BRICK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Chemical-resistant brick, used for flooring, base, and lining.
2. Industrial floor brick, used for flooring, base, and lining.
3. Portland-cement mortar and chemical-resistant resin grout.
4. Chemical-resistant resin mortar[**and chemical-resistant resin grout**].
5. Chemical-resistant sulfur mortar.
6. Chemical-resistant silicate mortar.
7. Chemical-resistant membrane.
8. Chemical-resistant joint sealants.

B. Related Requirements:

1. Section 096313 "Brick Flooring" for brick flooring not indicated as chemical resistant.
2. Section 221119 "Domestic Water Piping Specialties" for floor drains installed in chemical-resistant brick flooring.

1.2 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.
- ##### B. Samples for Verification: Full-size units of each type of brick indicated; in sets for each color, texture, and pattern specified with joints filled and cured.

1.4 CLOSEOUT SUBMITTALS

- ##### A. Maintenance Data: For chemical-resistant brick flooring to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- ##### A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials on elevated platforms, under cover, and in a dry location.
- B. Store mortar and grout materials in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing.
- C. If bricks become wet, do not install until they are air dry.
- D. Deliver, store, and handle bricks that have temporary protective coating, with coated surfaces placed against other coated surfaces. Do not allow coated surfaces to come in contact with uncoated surfaces.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with setting material manufacturer's written instructions for maintaining environmental conditions in installation areas before, during, and after installation, including ambient temperatures and relative humidity, substrate temperatures, and ventilation.
 - 1. Do not set brick flooring when air temperature, substrate temperature, or material temperature is below **50 deg F (10 deg C)**.
 - 2. Maintain minimum ambient temperature of **50 deg F (10 deg C)** during installation and for 14 days after completion unless higher temperatures are required by manufacturer's written instructions.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain each type of brick, setting material, and joint material from single source from single manufacturer or producer.

2.2 BRICK

- A. Chemical-Resistant Brick: Solid (uncored), unfrogged brick complying with ASTM C279, **[Type I][Type II][Type III]**, shape, and size indicated.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Belden Brick Company (The)]**
 - b. **[Bowerston Shale Company (The)]**
 - c. **[Endicott Clay Products Co]**
 - d. **[Jenkins Brick & Tile]**
 - e. **[Summitville Tiles, Inc.]**
 - f. **[Watson town Brick Company; General Shale Brick, Inc.]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Belden Brick Company (The)]**
 - b. **[Bowerston Shale Company (The)]**
 - c. **[Endicott Clay Products Co]**
 - d. **[Jenkins Brick & Tile]**
 - e. **[Summitville Tiles, Inc.]**
 - f. **[Watson town Brick Company; General Shale Brick, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Colors of Exposed Brick Surfaces: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
 4. Provide brick with **[smooth wearing surfaces][slip-resistant wearing surfaces with abrasive content][diagonal-scored wearing surfaces]** and **[scored bonding surfaces][wire-cut bonding surfaces][scored or wire-cut bonding surfaces, as standard with manufacturer]**.
- B. Industrial Floor Brick: Solid (uncored), unfrosted brick complying with ASTM C410, **[Type T][Type H][Type M][Type L]**, shape, and size indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Belden Brick Company (The)]**
 - b. **[Bowerston Shale Company (The)]**
 - c. **[Endicott Clay Products Co]**
 - d. **[Jenkins Brick & Tile]**
 - e. **[Summitville Tiles, Inc.]**
 - f. **[Watson town Brick Company; General Shale Brick, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Belden Brick Company (The)]**
 - b. **[Bowerston Shale Company (The)]**
 - c. **[Endicott Clay Products Co]**
 - d. **[Jenkins Brick & Tile]**
 - e. **[Summitville Tiles, Inc.]**
 - f. **[Watson town Brick Company; General Shale Brick, Inc.]**
 - g. **<Insert manufacturer's name>**
 3. Colors of Exposed Brick Surfaces: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
 4. Provide brick with **[smooth wearing surfaces][slip-resistant wearing surfaces with abrasive content][diagonal-scored wearing surfaces]** and **[scored bonding surfaces][wire-cut bonding surfaces][scored or wire-cut bonding surfaces, as standard with manufacturer]**.
- C. Base: Provide matching base at walls and vertical elements. Include special shapes for internal and external corners, stops, and where indicated.
1. Type: **[As indicated][Square-top cove][Round-top cove][Turn-up base]**.

- D. Lining Units: Provide units matching floor brick for lining pits and trenches and for facing curbs and pads occurring in floor brick field unless otherwise indicated. Provide special trim shapes for continuous coverage of substrates.
- E. Temporary Protective Coating: Coat exposed faces of brick with a thick continuous film of a temporary protective coating. Use coating that is compatible with brick and with mortar and grout products and that can be removed without damaging grout or brick, as recommended by brick and mortar and grout manufacturers. Do not coat unexposed brick surfaces.
 - 1. On slip-resistant surfaces with abrasive content, make coating thick enough to thoroughly cover abrasive granules.

2.3 PORTLAND-CEMENT-MORTAR SETTING-BED MATERIALS

- A. Cement: Portland cement, ASTM C150/C150M, Type I.
- B. Aggregate: ASTM C144.
- C. Cleavage Membrane: Asphalt felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, 4 mils (0.1 mm) thick.
- D. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, [2 by 2 inches (50 by 50 mm) by 0.062-inch- (1.6-mm-)]<Insert dimensions> diameter wire complying with ASTM A185/A185M and ASTM A82/A82M, except for minimum wire size.
- E. Water: Potable.

2.4 CHEMICAL-RESISTANT MORTAR AND JOINT MATERIALS

- A. General: Provide products of formulation recommended by manufacturer for application indicated.
- B. Resin Mortar for Setting Bed: ASTM C395, with [furan][epoxy][phenolic][polyester][vinyl-ester] resin and [carbon][silica] filler.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>

- C. Resin Mortar for Joints: ASTM C395, with [same resin and filler as setting bed][furan resin and carbon filler][high-adhesion furan resin and carbon filler][vinyl-ester resin and silica filler].
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>
 3. Colors of Exposed Joints: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
- D. Resin Grout: ASTM C658, with [furan][epoxy][vinyl-ester] resin and [carbon][silica] filler.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Atlas Minerals & Chemicals, Inc]
 - b. [Sauereisen]
 - c. [Summitville Tiles, Inc.]
 - d. <Insert manufacturer's name>
 3. Colors of Exposed Joints: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
- E. Sulfur Mortar: ASTM C287, with [carbon][silica] filler.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **<Insert manufacturer's name>**

F. Silicate Mortar: ASTM C466, **[sodium silicate][potassium silicate][silica]** type.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **<Insert manufacturer's name>**
- 3. Resists most solvents and oils.
- 4. Resists water and steam.
- 5. Highly resistant to sulfation.
- 6. Service Temperature: **[1200 deg F (650 deg C)][1700 deg F (920 deg C)]<Insert temperature>**.
- 7. **<Insert other requirements>**.

G. Chemical-Resistant Membrane: Multiple-component asphaltic system consisting of asphalt primer and asphalt-impregnated, woven glass-fiber cloth embedded in hot-melt asphalt compound, as recommended and produced by mortar and grout manufacturer for type of application indicated.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Summitville Tiles, Inc.]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**

- b. **[Summitville Tiles, Inc.]**
 - c. **<Insert manufacturer's name>**
 - H. Chemical-Resistant Joint Sealant: Chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with a proven service record and compatible with brick and other setting materials. Include primer and backer rod recommended by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atlas Minerals & Chemicals, Inc]**
 - b. **[Sauereisen]**
 - c. **[Summitville Tiles, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 3. Colors of Exposed Joints: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].**
- 2.5 MIXING SETTING-BED AND JOINT MATERIALS
- A. Comply with referenced standards and with manufacturer's written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grouts that have reached their initial set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine subfloor surfaces and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBFLOOR

- A. Vacuum clean subfloor to remove dirt, dust, debris, and other loose particles.

- B. Remove substances from subfloor that could impair bond of mortar, including curing and sealing compounds, form oil, and laitance.

3.3 INSTALLATION, GENERAL

- A. Do not use bricks with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in the finished Work.
- B. Cut bricks with motor-driven masonry saw to provide clean, sharp, unchipped edges. Hammer cutting is not acceptable. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
- C. Handle bricks that have temporary protective coating to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
- D. Joint Pattern and Widths:
 - 1. Lay brick in **[running bond][herringbone pattern][joint pattern shown][joint pattern matching existing brick flooring]**.
 - 2. Where joints are grouted after brick is set in place, provide a nominal joint width of **1/4 inch (6 mm)** and not less than **3/16 inch (5 mm)** unless otherwise indicated.
 - 3. Where joints are filled by troweling mortar on sides of units before brick is set in place, provide nominal joint width of **1/8 inch (3 mm)** and not less than **1/16 inch (1.5 mm)**.
- E. Finished Surface Tolerances: Do not exceed **[1/32-inch (1-mm) unit-to-unit offset from flush lippage or a tolerance of 1/8 inch in 10 feet (3 mm in 3 m)][1/16-inch (1.5-mm) unit-to-unit offset from flush lippage or a tolerance of 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m)]** from level or slope as indicated for finished surface of brick flooring.

3.4 CHEMICAL-RESISTANT RESIN-MORTAR APPLICATIONS

- A. Chemical-Resistant Membrane: Provide chemical-resistant asphaltic membrane system over concrete substrates beneath chemical-resistant mortar applications where indicated. Comply with membrane manufacturer's written directions for installing membrane.
- B. Flood Test Membrane: According to ASTM D5957, before installing brick flooring, remove water and dry membrane.
- C. Bricklayer's Method: Comply with ASTM C399 and mortar manufacturer's written directions. Lay units in resin-mortar setting bed, and provide full joints of resin mortar by spreading or buttering mortar on sides of units before setting them in place.
- D. Tile Setter's Method: Comply with ASTM C723 and mortar and grout manufacturer's written directions. Lay units in resin-mortar setting bed, and fill joints with resin grout.
- E. Vertical Surfaces: Set units with resin mortar for joints, **[including][and sulfur for]** back joint, to comply with ASTM C399 **[and ASTM C386]**.

3.5 PORTLAND-CEMENT-MORTAR AND RESIN-GROUT APPLICATIONS

- A. Comply with ASTM C398 for application of units in portland-cement-mortar setting bed. Comply with ASTM C723 and grout manufacturer's written directions for grouting joints with resin grout of type indicated.
- B. Cleavage Membrane: Install a continuous membrane with **2-inch- (50-mm-)** minimum lapped joints over subfloor.
- C. Setting-Bed Reinforcement: Install continuous welded-wire fabric with **4-inch- (100-mm-)** minimum lapped joints in setting bed.
- D. Vertical Surfaces: Install units to comply with ASTM C399 using resin mortar for joints.

3.6 CHEMICAL-RESISTANT SULFUR-MORTAR APPLICATIONS

- A. Comply with ASTM C386 and mortar manufacturer's written directions.
- B. Provide brick bed joint formed by laying units on sulfur-mortar chips. Use chips sized to provide not less than **1/4-inch- (6-mm-)** nor more than **5/16-inch- (8-mm-)** thick, horizontal bed joint. Provide three spacer chips per brick.

3.7 CHEMICAL-RESISTANT SILICATE-MORTAR APPLICATIONS

- A. Bricklayer's Method: Comply with ASTM C397 and mortar manufacturer's written directions. Lay units in silicate-mortar setting bed, and provide full joints of silicate mortar by spreading or buttering mortar on sides of units before setting them in place.

3.8 INSTALLING JOINT SEALANTS

- A. Do not fill joints that are to receive sealant. Prepare joints for sealant by raking joints clean for depth of unit thickness plus setting bed as indicated.
- B. Install joint sealants, including[**chemical-resistant sealants specified in this Section,**] primer, and backer rod, to comply with sealant manufacturer's written directions and Section 079200 "Joint Sealants."

3.9 REPAIRING, POINTING, AND CLEANING

- A. Remove bricks that are loose, chipped, broken, stained, or damaged, or that do not match adjoining units. Provide new units to match adjoining units, installed in fresh mortar and pointed or grouted to eliminate evidence of repair.
- B. Pointing: During joint tooling, enlarge voids or holes and completely fill with mortar or grout. For voids deeper than **1/8 inch (3 mm)** and less than **1/8 inch (3 mm)** wide, remove and relay brick.
- C. Cleaning: Remove excess mortar and grout from exposed brick surfaces, wash, and scrub clean.
 - 1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to brick and grout manufacturers. Trap and remove coating to prevent it from clogging drains.



09 - Finishes

END OF SECTION 09 63 13 00A



Task	Specification	Specification Description
09 63 43 00	09 67 23 00	Resinous Flooring



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SECTION 09 64 00 00 - WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-finished wood flooring.
2. Factory-finished wood flooring.
3. Sound control underlayment.

B. Related Requirements:

1. Section 096436 "Bamboo Flooring" for **[factory-finished][field-finished]** solid-bamboo and engineered-bamboo flooring.
2. Section 096466 "Wood Athletic Flooring" for resilient-wood flooring systems used in sports-activity areas.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review methods and procedures related to resilient athletic flooring installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. **<Insert agenda items>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood flooring.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Shop Drawings: For each type of floor assembly and accessory. Include plans, sections, and attachment details. Include expansion provisions and trim details.

C. Samples: For each exposed product and for each color and texture specified, approximately **[12 inches (300 mm) long]<Insert dimension>** and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for wood flooring.

1. Include Samples of accessories involving color and finish selection.

- E. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately **[12 inches (300 mm) long]<Insert dimension>** and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.
- F. Sustainable Design Submittals:
 - 1. Product Data: Verify compliance with requirements for Forest Stewardship Council U.S. (FSC).
 - 2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 4. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
 - 5. Product Data: For installation adhesives, indicating VOC content.
 - 6. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood flooring and finish systems.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Flooring: Equal to **[1]<Insert number>** percent of amount installed for each type, color, and finish of wood flooring indicated.

1.6 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice, including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: Provide proof of use of vendors that are certified for chain of custody by an FSC-accredited certification body.

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup **[as indicated on Drawings]<Insert mockup requirements>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.

- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.9 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
 - 1. Environmental Conditioning: Maintain ambient temperature between **65 and 75 deg F (18 and 24 deg C)** and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hardwood Flooring: Comply with NWFA A500 for species, grade, and cut.
 - 1. Certification: Provide flooring that carries NWFA grade stamp on each bundle or piece.
- B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- C. Softwood Flooring: Comply with WCLIB No. 17 grading rules for species, grade, and cut.
- D. Sound Transmission Characteristics (STC): Provide wood flooring and sound control underlayment systems identical to those of assemblies laboratory tested for STC **[50]** and Impact Insulation Class (IIC) **[50]** ratings in accordance with ASTM E90 and ASTM E492 by a qualified testing agency.
- E. Field Sound Transmission Class (FSTC): Unless otherwise noted, provide wood floor and ceiling assembly with minimum FSTC rating of **[45]** between housing units for each assembly indicated. Sound transmission loss is to be measured in accordance with ASTM E336, with calculation procedures as defined in ASTM E413.
- F. Field Impact Isolation Classification (FIIC): Unless otherwise noted, provide wood floor and ceiling assembly with minimum FIIC rating of **[45]** between housing units for each assembly indicated.

Transmission of impact sound is to be measured in accordance with ASTM E1007. Minimum Impact Insulation Class (IIC) of [50][55]<Insert value> when tested in accordance with ASTM E492.

- G. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- I. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Certified Wood: Verify product is certified as "FSC Pure"[or "**FSC Mixed Credit**"] in accordance with FSC STD-01-001 and FSC STD-40-004.
- K. Certified Wood: Verify product is labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- L. Certified Wood: Verify product is certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- M. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- N. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- O. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 1. VOC Content: Provide coating with VOC content of 275 g/L or less.
 - 2. VOC Content: Provide coating with VOC content of 100 g/L or less.
- P. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- Q. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

2.2 FIELD-FINISHED WOOD FLOORING

- A. Solid-Wood Flooring, Field Finished: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[AHF Products]**
 - b. **[Appalachian Flooring]**
 - c. **[Carlisle Wide Plank Floors]**
 - d. **[Oregon Lumber Company]**
 - e. **[Somerset Hardwood Flooring]**
 - f. **[WD Flooring, LLC]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AHF Products]**
 - b. **[Appalachian Flooring]**
 - c. **[Carlisle Wide Plank Floors]**
 - d. **[Oregon Lumber Company]**
 - e. **[Somerset Hardwood Flooring]**
 - f. **[WD Flooring, LLC]**
 - g. **<Insert manufacturer's name>**
 3. Grade and Species: **[Clear red oak][Select red oak][No. 1 Common red oak][No. 2 Common red oak][MFMA-RL First Grade hard maple][MFMA-RL Second and Better Grade hard maple][Grade C & BTR - Flooring Douglas fir][Grade D - Flooring Douglas fir]<Insert grade and species>**.
 4. Cut: **[Plain sawn][Quarter/rift sawn][Edge grain][Vertical grain]<Insert description>**.
 5. Thickness: **[25/32 inch (20 mm)][3/4 inch (19 mm)]<Insert dimension>**.
 6. Face Width: **[2-1/4 inches (57 mm)][3-1/4 inches (83 mm)][5-1/8 inches (130 mm)]<Insert dimension>**.
 7. Lengths: **[Manufacturer's standard][Random-length strips complying with applicable grading rules][Lengths required to form pattern indicated]<Insert requirements>**.
 8. Simulated Wood Pegs: Contrasting wood pegs at ends of flooring pieces.
- B. Solid-Wood Parquet Flooring, Field Finished: Kiln dried to 6 to 9 percent maximum moisture content.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Carlisle Wide Plank Floors]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Carlisle Wide Plank Floors]**
 - b. **<Insert manufacturer's name>**
 3. Species: **[Red oak][White oak][Ash][Maple][Black cherry]<Insert species>**.
 4. Grade: **<Insert grade>**.
 5. Thickness: **[5/16 inch (8 mm)][11/16 inch (17 mm)][1/4 inch (6 mm)]<Insert dimension>**.
 6. Pattern: **<Insert description>**.
 7. Size: **<Insert dimension>**.
- C. Engineered-Wood Flooring, Field Finished: HPVA EF[, **complying with requirements for composite wood products**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Carlisle Wide Plank Floors]**
 - b. **[Oregon Lumber Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Carlisle Wide Plank Floors]**
 - b. **[Oregon Lumber Company]**
 - c. **<Insert manufacturer's name>**
 3. Species: **[Red oak][White oak][Ash][Beech][Maple][Black cherry]<Insert species>**.
 4. Grade: **<Insert grade>**.
 5. Thickness: **[1/2 inch (13 mm)][3/8 inch (10 mm)]<Insert dimension>**.
 6. Construction: **[Five][Three] ply**.
 7. Face Width: **[2-1/4 inches (57 mm)][3 inches (76 mm)]<Insert dimension>**.
 8. Length: Manufacturer's standard.
- D. Urethane Finish System: Complete **[solvent-based, oil-modified][water-based]** system of compatible components that is recommended by finish manufacturer for application indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Absolute Coatings, Inc.]**
 - b. **[Basic Coatings]**
 - c. **[Bona US]**
 - d. **[Dura Seal]**
 - e. **[Hillyard, Inc.]**
 - f. **[MAPEI Corporation]**
 - g. **[PoloPlaz]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Absolute Coatings, Inc.]**
 - b. **[Basic Coatings]**
 - c. **[Bona US]**
 - d. **[Dura Seal]**
 - e. **[Hillyard, Inc.]**
 - f. **[MAPEI Corporation]**
 - g. **[PoloPlaz]**
 - h. **<Insert manufacturer's name>**
- E. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- F. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 5. VOC Content: Provide coating with VOC content of 275 g/L or less.
 6. VOC Content: Provide coating with VOC content of 100 g/L or less.
 7. Stain: Penetrating and nonfading type.
- a. Color: **[Match sample][As selected by Architect from manufacturer's full range]<Insert color>**.
8. Floor Sealer: Pliable, penetrating type.
 9. Finish Coats: Formulated for multicoat application on wood flooring.
- G. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.3 FACTORY-FINISHED WOOD FLOORING

- A. Solid-Wood Flooring, Factory Finished: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AHF Products]**
 - b. **[Anderson Tufftex]**
 - c. **[Appalachian Flooring]**
 - d. **[Carlisle Wide Plank Floors]**
 - e. **[Somerset Hardwood Flooring]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[AHF Products]**
 - b. **[Anderson Tuftex]**
 - c. **[Appalachian Flooring]**
 - d. **[Carlisle Wide Plank Floors]**
 - e. **[Somerset Hardwood Flooring]**
 - f. **<Insert manufacturer's name>**
 3. Species: **[Red oak][White oak][Ash][Birch][Maple][Black cherry][Hickory][Walnut]<Insert species>**.
 4. Grade: **<Insert grade>**.
 5. Cut: **[Plain sawn][Quarter/rift sawn][Edge grain][Vertical grain]<Insert description>**.
 6. Thickness: **[3/4 inch (19 mm)][25/32 inch (20 mm)]<Insert dimension>**.
 7. Face Width: **[2-1/4 inches (57 mm)][3-1/4 inches (83 mm)][5-1/8 inches (130 mm)]<Insert dimension>**.
 8. Lengths: **[Random-length strips complying with applicable grading rules][Lengths required to form pattern indicated]<Insert requirements>**.
 9. Edge Style: **[Square][Beveled (eased)]<Insert style>**.
 10. Finish: UV urethane.
 - a. Color: **[As selected by Architect from manufacturer's full range]<Insert color>**.
- B. Solid-Wood Parquet Flooring, Factory Finished: Kiln dried to 6 to 9 percent maximum moisture content.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Carlisle Wide Plank Floors]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Carlisle Wide Plank Floors]**
 - b. **<Insert manufacturer's name>**
 3. Species: **[Red oak]<Insert species>**.
 4. Grade: **<Insert grade>**.
 5. Thickness: **[5/16 inch (8 mm)][11/16 inch (17 mm)][1/4 inch (6 mm)]<Insert dimension>**.
 6. Edge Style: **<Insert style>**.
 7. Pattern: **<Insert description>**.
 8. Size: **<Insert dimension>**.
 9. Finish: **[UV urethane][Acrylic impregnated]**.
 - a. Color: **[As selected by Architect from manufacturer's full range]<Insert color>**.
- C. Engineered-Wood Flooring, Factory Finished: HPVA EF[, **complying with requirements for composite wood products**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[AHF Products]**
 - b. **[Anderson Tufftex]**
 - c. **[Boen]**
 - d. **[Carlisle Wide Plank Floors]**
 - e. **[Johnsonite; a Tarkett company]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Nydree Flooring]**
 - h. **[Oregon Lumber Company]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AHF Products]**
 - b. **[Anderson Tufftex]**
 - c. **[Boen]**
 - d. **[Carlisle Wide Plank Floors]**
 - e. **[Johnsonite; a Tarkett company]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Nydree Flooring]**
 - h. **[Oregon Lumber Company]**
 - i. **<Insert manufacturer's name>**
 3. Species: **[Red oak][White oak][Ash][Beech][Birch][Maple][Black cherry][Hickory][Walnut]<Insert species>**.
 4. Grade: **<Insert grade>**.
 5. Thickness: **[1/2 inch (13 mm)][3/8 inch (10 mm)]<Insert dimension>**.
 6. Construction: **[Five][Three] ply**.
 7. Face Width: **[2-1/4 inches (57 mm)][3 inches (76 mm)]<Insert dimension>**.
 8. Length: Manufacturer's standard.
 9. Edge Style: **[Square][Beveled (eased)]<Insert style>**.
 10. Finish: **[UV urethane][Acrylic impregnated]**.
 - a. Color: **[As selected by Architect in manufacturer's full range]<Insert color>**.
- D. Engineered-Wood Parquet Flooring, Factory Finished: HPVA EF[, **complying with requirements for composite wood products**].
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Boen]**
 - b. **[Carlisle Wide Plank Floors]**
 - c. **[Johnsonite; a Tarkett company]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Boen]**
 - b. **[Carlisle Wide Plank Floors]**
 - c. **[Johnsonite; a Tarkett company]**

d. <Insert manufacturer's name>

3. Species: [Red oak][Ash][Beech][Maple][Walnut]<Insert species>.
4. Grade: <Insert grade>.
5. Thickness: [3/8 inch (10 mm)][1/2 inch (13 mm)]<Insert dimension>.
6. Construction: [Five][Three] ply.
7. Edge Style: <Insert style>.
8. Pattern: <Insert description>.
9. Size: <Insert dimension>.
10. Finish: UV urethane.

a. Color: [As selected by Architect from manufacturer's full range]<Insert color>.

2.4 SOUND CONTROL UNDERLAYMENT

- A. Sound Control Underlayment: Sound-reducing underlayment consisting of impact-absorbing materials.
 1. Material: [Recycled rubber][Polyurethane foam][Cork][Wood fiber][Wood fiber complying with requirements for composite wood products]<Insert material>.
 2. Thickness: [3/4 inch (19 mm)][1/2 inch (13 mm)][3/8 inch (10 mm)][1/4 inch (6 mm)][5/32 inch (4 mm)]<Insert dimension>.
- B. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

2.5 ACCESSORY MATERIALS

- A. Wood Sleepers and Subfloor: [As specified in Section 061000 "Rough Carpentry" and Section 061600 "Sheathing."]<Insert requirements.>
- B. Wood Underlayment: [As specified in Section 061600 "Sheathing."]<Insert requirements.>
- C. Vapor Retarder: ASTM D4397, polyethylene sheet not less than [6.0 mils (0.15 mm)][8.0 mils (0.2 mm)] thick.
- D. Asphalt-Saturated Felt: ASTM D4869/D4869M, Type II.
- E. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.
 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
 4. Verify adhesive has a VOC content of [100]<Insert number> g/L or less.

- 5. Verify adhesives have a VOC content of [30]<Insert number> g/L or less.
- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- G. Fasteners: As recommended by manufacturer, but not less than that recommended in [NWFA's "Wood Flooring Installation Guidelines."]<Insert standard or publication.>
- H. Thresholds and Saddles: To match wood flooring. Tapered on each side.
- I. Reducer Strips: To match wood flooring; [2 inches (51 mm)]<Insert dimension> wide, tapered, and in thickness required to match height of flooring.
- J. Cork Expansion Strip: Composition cork strip.
- K. Feature Strips: [2-inch- (51-mm-) wide, square-edged walnut strips]<Insert description>, furnished in lengths as long as practical and in thickness to match wood flooring.
- L. Metal Feature Strips: [1/8-by-1/8-inch (3-by-3-mm) solid-brass strips]<Insert description>, designed for inlaying into routed reveal in wood flooring surface.
- M. Wood Air Vents and Grilles: To match wood flooring and in sizes and design indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels in accordance with manufacturer's written installation instructions.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area> and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)][4.5 lb of water/1000 sq. ft. (2.04 kg of water/92.9 sq. m)]<Insert emission> in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [80][75]<Insert number> percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots to produce a maximum **1/8-inch (3-mm)** deviation in any direction when checked with a **10 ft. (3 m)** straight edge.
 - 2. Use trowelable leveling and patching compounds, in accordance with manufacturer's written installation instructions, to fill cracks, holes, and depressions in substrates.
 - 3. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF WOOD FLOORING

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in **[NWFA's "Wood Flooring Installation Guidelines."]<Insert standard or publication.>**
- B. Wood Sleepers and Subfloor: **[Install in accordance with requirements in Section 061000 "Rough Carpentry" and Section 061600 "Sheathing."]<Insert requirements.>**
- C. Wood Underlayment: **[Install in accordance with requirements in Section 061600 "Sheathing."]<Insert requirements.>**
- D. Provide expansion space at walls and other obstructions and terminations of flooring **[as indicated on Drawings][of not less than 3/4 inch (19 mm)]<Insert requirements>**.
- E. Vapor Retarder: Comply with the following for vapor retarder installation:
 - 1. Wood Flooring Nailed to Wood Subfloor: Install flooring over a layer of asphalt-saturated felt.
 - 2. Wood Flooring Nailed to Sleepers over Concrete: Install flooring over a layer of polyethylene sheet with edges overlapped over sleepers and turned up behind baseboards.
 - 3. Wood Flooring Installed Directly on Concrete: Install a layer of polyethylene sheet in accordance with flooring manufacturer's written installation instructions.
- F. Sound Control Underlayment: Install over vapor retarder in accordance with manufacturer's written installation instructions.
- G. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
 - 1. Plank Flooring: For flooring of face width more than 3 inches (76 mm):
 - a. Hardwood: Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.
 - b. Softwood: Install no fewer than two countersunk nails at each end of each piece, spaced not more than **16 inches (406 mm)** along length of each piece, in addition to blind nailing. Fill holes with matching wood filler.
- H. Solid-Wood Parquet Flooring: Set in adhesive in pattern indicated on Drawings.

- I. Engineered-Wood Flooring: **[Set in adhesive][Nail or staple][Install floating floor]**.

3.4 FIELD FINISHING

- A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that are noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
 - 1. Comply with applicable recommendations in **[NWFA's "Wood Flooring Installation Guidelines."]**<Insert standard or publication.>
- B. Fill **[open-grained hardwood]**<Insert description of wood to be filled>.
- C. Fill and repair wood flooring defects.
- D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and **[three]**<Insert number> finish coats.
 - 1. Apply stains to achieve an even color distribution matching approved Samples.
 - 2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
- E. Cover wood flooring before finishing.
- F. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
 - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 64 00 00



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Task	Specification	Specification Description
09 64 13 00	09 64 00 00	Wood Flooring
09 64 23 00	09 64 00 00	Wood Flooring
09 64 23 00	09 64 66 00	Wood Athletic Flooring
09 64 29 00	09 64 00 00	Wood Flooring
09 64 29 00	09 64 66 00	Wood Athletic Flooring



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SECTION 09 64 66 00 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Wood athletic flooring system including, but not limited to, the following:
 - 1. Flooring materials.
 - 2. Subfloor materials.
 - 3. Finish system.
- B. Related Requirements:
 - 1. Section 096400 "Wood Flooring" for traditional solid-wood and engineered-wood, strip, plank, and parquet flooring.

1.2 COORDINATION

- A. Coordinate layout and installation of slab depressions to accommodate layout and height of wood athletic flooring system.
- B. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Review methods and procedures related to resilient athletic flooring installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. **<Insert agenda items>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Shop Drawings: For each type of floor system, include the following:
 - 1. Plans, sections, and attachment details.
 - 2. Details of concrete-slab depressions.
 - 3. Locations of different grades of wood flooring.
 - 4. Expansion provisions and trim details.

5. Layout, colors, widths, and dimensions of game lines and markers.
6. Locations of floor inserts for athletic equipment installed through flooring system.
7. **<Insert requirements>**.

C. Samples: For each exposed product and for each color and texture specified, approximately **[12 inches (305 mm) long]<Insert dimension>** in size.

1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.
2. Include Sample sets showing finishes[**and game-line and marker paints**] applied to wood flooring.

D. Samples for Initial Selection: For each type of wood athletic flooring and accessory in each type of exposed color and finish.

1. Include manufacturer's color charts showing colors and glosses available for the following:
 - a. Floor finishes.
 - b. Game-line and marker paints.

E. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately **[12 inches (300 mm) long]<Insert dimension>** and of same thickness and material indicated for the Work.

1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.
2. Include Sample sets showing finishes[**and game-line and marker paints**] applied to wood flooring.

F. Sustainable Design Submittals:

1. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
2. Product Data: For installation adhesives, indicating VOC content.
3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
4. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
5. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
6. Product Data: Verify compliance with requirements for Forest Stewardship Council U.S. (FSC).

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems.

1.7 QUALITY ASSURANCE

- A. Vendor Qualifications: Provide proof of use of vendors that are certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice, including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer in accordance with the MFMA Accreditation Program.
 - 1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.
 - 1. Build mockup [**as indicated on Drawings**]<Insert mockup requirements>.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver floor system materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.10 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain ambient temperature between **65 and 75 deg F (18 and 24 deg C)** and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.

- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Certified Wood: Verify product is certified as "FSC Pure"[or "**FSC Mixed Credit**"] in accordance with FSC STD-01-001 and FSC STD-40-004.
- B. Certified Wood: Verify product is labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- C. Certified Wood: Verify product is certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 - 1. Verify adhesive has a VOC content of [100]<Insert number> g/L or less.
- D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- E. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

2.2 WOOD ATHLETIC FLOORING SYSTEM

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [Aacer Sports Flooring, an Infinity Wood Floors Company]
 - 2. [Action Floor Systems, LLC]
 - 3. [Connor Sports]
 - 4. [Horner Sports Flooring]
 - 5. [Robbins Sports Surfaces]
 - 6. [WD Flooring, LLC]
 - 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Aacer Sports Flooring, an Infinity Wood Floors Company]
2. [Action Floor Systems, LLC]
3. [Connor Sports]
4. [Horner Sports Flooring]
5. [Robbins Sports Surfaces]
6. [WD Flooring, LLC]
7. <Insert manufacturer's name>

C. System Type: [Floating][Fixed][Anchored resilient][Portable]<Insert system>.

D. Overall System Height: [As indicated on Drawings][2-1/8 inches (54 mm)][2-1/4 inches (57 mm)][2-1/2 inches (64 mm)]<Insert height>.

2.3 FLOORING MATERIALS

A. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.

1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

B. Random-Length Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.

1. Grade: MFMA-RL [First][Second and Better][Third and Better].

- a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.

2. Cut: [Edge][Flat].

3. Thickness: [25/32 inch (20 mm)][33/32 inch (26 mm)]<Insert dimension>.

4. Face Width: [2-1/4 inches (57 mm)][1-1/2 inches (38 mm)]<Insert dimension>.

C. Finger-Jointed Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.

1. Grade: MFMA-FJ [First][Second and Better][Third and Better].

- a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.

2. Cut: [Edge][Flat].

3. Thickness: [25/32 inch (20 mm)][33/32 inch (26 mm)]<Insert dimension>.

4. Face Width: [2-1/4 inches (57 mm)][1-1/2 inches (38 mm)]<Insert dimension>.

D. Parquet Flooring: Northern hard maple (*Acer saccharum*), kiln dried, edge grain, and square edge.

1. Grade: MFMA-PQ [Second and Better][Third and Better].

2. Thickness: Not less than [5/16 inch (8 mm)][3/8 inch (10 mm)][7/16 inch (11 mm)][1/2 inch (13 mm)][11/16 inch (17 mm)]<Insert dimension>.

3. Picket Dimensions:

- a. Width: [7/8 inch (22 mm)][or][1-1/8 inches (29 mm)].

- b. Length: [6 inches (152 mm)][9 inches (229 mm)]<Insert dimension>.

2.4 SUBFLOOR MATERIALS

- A. Board Underlayment: Nominal **1-by-6-inch (25-by-152-mm)** graded boards; of SPIB No. 2 Southern pine, WCLIB Construction grade (any species), or WWPA No. 3 (any species), dried to 15 percent moisture content.
- B. Plywood Underlayment: APA rated, C-D plugged, exterior glue, tongue and groove, **[15/32 inch (12 mm)][23/32 inch (18 mm)]** thick.
- C. Wood Sleepers: Standard grade; **48 inches (1200 mm)** long; kiln-dried Eastern hemlock, fir, pine, or spruce.
 - 1. Size: Nominal **[2 by 3 inches (51 by 76 mm)][2 by 4 inches (51 by 102 mm)]**.
 - 2. Sleeper Anchors: Manufacturer's standard drive pins recommended by anchor manufacturer to achieve minimum **900 lbf (4000 N)** pullout strength in **3000 psi (20.7 MPa)** concrete.
 - 3. Sleeper Shims: In size and type recommended in writing by flooring manufacturer for application indicated.
 - 4. Asphalt Primer: ASTM D41/D41M.
 - 5. Asphalt Mastic: ASTM D312, Type I, cold-applied dead-level asphalt or Type III, hot-applied steep asphalt, as recommended in writing by manufacturer.
- D. Channels: **[Manufacturer's standard as indicated by product designation above]<Insert description>**.
 - 1. Channel Anchors: Manufacturer's standard, but not less than modified steel drive pins recommended by anchor manufacturer to achieve minimum **900 lbf (4000 N)** pullout strength.
 - 2. Clips: **[Manufacturer's standard as indicated by product designation above]<Insert description or proprietary product name>**.
- E. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
 - 1. Type: **<Insert description>**.
 - 2. Material: **[PVC][Rubber][Neoprene]<Insert requirements>**.
 - 3. Thickness: **[3/8 inch (10 mm)][7/16 inch (11 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)]<Insert dimension>**.
- F. Resilient Underlayment: Flexible, multicellular, closed-cell, expanded polyethylene-foam sheet; nominal **2 lb/cu. ft. (32 kg/cu. m)** density.
 - 1. Thickness: **[1/4 inch (6 mm)][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension>**.

2.5 FINISH SYSTEM

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type from MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: **[MFMA Group 3, Gymnasium-Type Surface Finishes][MFMA Group 5, Water-Based Finishes]<Insert finish>**.

3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.
4. Verify adhesive has a VOC content of [50][70]<Insert number> g/L or less.

2.6 ACCESSORIES

- A. Vapor Retarder: ASTM D4397, polyethylene sheet not less than **6 mils (0.15 mm)** thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; **4 by 3 by 48 inches (102 by 76 by 1200 mm)**; with premolded outside corners.
 1. Color: [Black][Brown].
- C. Wood Wall Base: [Nominal 1-by-3-inch (25-by-76-mm) wood base][Built-up wood base as indicated on Drawings]<Insert description> matching species, grade, and cut of wood flooring.
- D. Thresholds: [As specified in Section 087100 "Door Hardware."]<Insert requirements.>
- E. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- G. Adhesives: Manufacturer's standard for application indicated.
 1. Verify adhesive has a VOC content of [50][70]<Insert number> g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels in accordance with manufacturer's written installation instructions.
 1. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)][4.5 lb of water/1000 sq. ft. (2.04 kg of water/92.9 sq. m)]<Insert emission> in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [80][75]<Insert number> percent relative humidity level measurement.

- c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. Concrete Slabs:

1. Grind high spots and fill low spots on concrete substrates to produce a maximum **1/8-inch (3-mm)** deviation in any direction when checked with a **10 ft. (3 m)** straight edge.
2. Use trowelable leveling and patching compounds, in accordance with manufacturer's written installation instructions, to fill cracks, holes, and depressions in substrates.
3. Remove coatings, including curing compounds and other substances, on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.

- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF WOOD ATHLETIC FLOORING

- A. Comply with wood athletic flooring manufacturer's written installation instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.

- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.

- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written installation instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.

1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.

- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of **6 inches (152 mm)** and sealed.

- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.

F. Sleepers:

1. Prime entire slab beneath wood floor area with asphalt primer at coverage rate recommended by manufacturer.
2. Install sleepers perpendicular to direction of flooring, staggering end joints a minimum of **[24 inches (610 mm)]<Insert dimension>**.
3. Space **[at spacing recommended by manufacturer for system components indicated][12 inches (305 mm) o.c.][9 inches (229 mm) o.c.][8 inches (203 mm) o.c.]<Insert requirements>**.
4. Shim and level sleepers and install anchors at spacing recommended by manufacturer, but not less than **30 inches (760 mm) o.c.**
5. Pour asphalt mastic to **1/8 inch (3 mm)** above the level of shims.
6. Anchor predrilled sleepers through resilient pads.

- G. Channels: Anchor channels to substrate in accordance with manufacturer's written installation

instructions.

1. Install wood strip flooring across channels.
2. Insert steel clip at each intersection of a flooring strip with a channel.

- H. Strip Flooring: Mechanically fasten perpendicular to supports.
- I. Parquet Flooring: Adhere to substrates in accordance with manufacturer's written installation instructions.
- J. Installation Tolerances: **1/8 inch in 10 ft. (3 mm in 3 m)** of variance from level.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system in accordance with finish manufacturer's written installation instructions. Provide no fewer than **[four]<Insert number>** coats total and no fewer than **[two]<Insert number>** finish coats.
 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat in accordance with paint manufacturer's written installation instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors in accordance with **[requirements indicated on Drawings]<Insert name of sport association publication>**.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 64 66 00



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Task	Specification	Specification Description
09 64 66 00	09 64 00 00	Wood Flooring



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SECTION 09 65 13 00 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset rubber base.
2. Thermoplastic rubber base.
3. Vinyl base.
4. Rubber stair treads.
5. Vinyl stair treads.
6. Rubber molding accessories.
7. Vinyl molding accessories.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
3. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.
5. Section 096813 "Tile Carpeting" for modular carpet tile flooring.
6. Section 096816 "Sheet Carpeting" for tufted and woven carpet flooring.
7. Section 104513 "Photoluminescent Egress Path Markings" for luminous stair accessories.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference **[at Project site][by web conference]<Insert location>** .

1. Review methods and procedures related to resilient base and accessory installation including, but not limited to, the following:
 - a. Delivery, storage, and handling procedures.
 - b. Ambient conditions and ventilation procedures.
 - c. Subfloor preparation procedures for resilient stair accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Samples: For each exposed product and for each color and texture specified, not less than **12 inches (300 mm)** long.

C. Samples for Initial Selection: For each type of exposed product.

- D. Samples for Verification: For each type of exposed product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than **12 inches (300 mm)** long.
- E. Product Schedule: For resilient base and accessory products. [**Use same designations indicated on Drawings.**]
- F. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): For each product.
 - 2. Health Product Declaration (HPD): For each product.
 - 3. Environmental Product Declaration (EPD): For each product.
 - 4. Health Product Declaration (HPD): For each product.
 - 5. Environmental Product Declaration (EPD): For each product.
 - 6. Environmental Product Declaration (EPD): For each product.
 - 7. Environmental Product Declaration (EPD): For each product.
 - 8. Third-Party Certifications: For each product.
 - 9. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For resilient base and accessory products, for tests performed by a qualified testing agency.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials [, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than [**10 linear ft. (3 linear m)**]**<Insert dimension>** for every [**500 linear ft. (150 linear m)**]**<Insert dimension>** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.6 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**.

1.8 FIELD CONDITIONS

- A. Installation Temperature Requirements: Maintain ambient temperatures within range recommended by manufacturer, but not less than [70 deg F (21 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature> , in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Post-Installation Temperature Requirements: After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than [55 deg F (13 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature> .
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 RESILIENT BASE

- A. Thermoset Rubber Base :
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Mannington Mills, Inc]
 - b. [Roppe Corporation; Roppe Holding Company]
 - c. [Tarkett USA]
 - d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Mannington Mills, Inc]**
 - b. **[Roppe Corporation; Roppe Holding Company]**
 - c. **[Tarkett USA]**
 - d. **<Insert manufacturer's name>**
3. Classification: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
4. Style and Location:
 - a. Style A, Straight: **[Provide in areas with carpet]<Insert area requirements>** .
 - b. Style B, Cove: **[Provide in areas with resilient floor coverings]<Insert area requirements>** .
 - c. Style C, Butt-to: **<Insert area requirements>** .
5. Thickness: **[0.125 inch (3.2 mm)][0.25 inch (6.4 mm)][0.375 inch (9.6 mm)]<Insert dimension>** .
6. Height: **[2-1/2 inches (64 mm)][3 inches (76 mm)][3-1/2 inches (89 mm)][4 inches (102 mm)][4-1/2 inches (114 mm)][5 inches (127 mm)][5-1/2 inches (140 mm)][6 inches (152 mm)][As indicated on Drawings]** .
7. Lengths: **[Cut lengths 48 inches (1219 mm) long][Coils in manufacturer's standard length][Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length]** .
8. Outside Corners: **[Job formed][Preformed][Job formed or preformed]** .
9. Inside Corners: **[Job formed][Preformed][Job formed or preformed]** .
10. Colors: **[As indicated by manufacturer's designations][Match Architect's sample]<Insert colors>** .

B. Thermoplastic Rubber Base :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Allstate Flooring]**
 - b. **[Armstrong Flooring, Inc.]**
 - c. **[Flexco Corporation]**
 - d. **[Forbo Flooring Systems]**
 - e. **[Roppe Corporation; Roppe Holding Company]**
 - f. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - g. **[Tarkett USA]**
 - h. **[VPI Corporation]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Allstate Flooring]**
 - b. **[Armstrong Flooring, Inc.]**
 - c. **[Flexco Corporation]**
 - d. **[Forbo Flooring Systems]**

- e. **[Roppe Corporation; Roppe Holding Company]**
 - f. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - g. **[Tarkett USA]**
 - h. **[VPI Corporation]**
 - i. **<Insert manufacturer's name>**
- 3. Classification: ASTM F1861, Type TP (rubber, thermoplastic), Group **[I (solid, homogeneous)][or][II (layered)]** .
 - 4. Style and Location:
 - a. Style A, Straight: **[Provide in areas with carpet]<Insert area requirements>** .
 - b. Style B, Cove: **[Provide in areas with resilient floor coverings]<Insert area requirements>** .
 - c. Style C, Butt-to: **<Insert area requirements>** .
 - d. Style D, Sculptured: **<Insert area requirements>** .
 - 1) Profile: **[As indicated on Drawings]<Insert profile requirement>** .
 - 5. Thickness: **[0.125 inch (3.2 mm)][0.25 inch (6.4 mm)][0.375 inch (9.6 mm)]<Insert dimension>** .
 - 6. Height: **[2-1/2 inches (64 mm)][4 inches (102 mm)][6 inches (152 mm)][As indicated on Drawings]** .
 - 7. Lengths: **[Cut lengths 48 inches (1219 mm) long][Coils in manufacturer's standard length][Cut lengths 98 inches (2438 mm) long or coils in manufacturer's standard length]** .
 - 8. Outside Corners: **[Job formed][Preformed][Job formed or preformed]** .
 - 9. Inside Corners: **[Job formed][Preformed][Job formed or preformed]** .
 - 10. Colors: **[As indicated by manufacturer's designations][Match Architect's sample]<Insert colors>** .

C. Vinyl Base :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Flexco Corporation]**
 - b. **[Mannington Mills, Inc]**
 - c. **[Mohawk Group]**
 - d. **[Roppe Corporation; Roppe Holding Company]**
 - e. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - f. **[Tarkett USA]**
 - g. **[VPI Corporation]**
 - h. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flexco Corporation]**
 - b. **[Mannington Mills, Inc]**
 - c. **[Mohawk Group]**
 - d. **[Roppe Corporation; Roppe Holding Company]**
 - e. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - f. **[Tarkett USA]**
 - g. **[VPI Corporation]**

- h. <Insert manufacturer's name>
- 3. Classification: ASTM F1861, Type TV (vinyl, thermoplastic), Group [I (solid, homogeneous)][or][II (layered)] .
- 4. Style and Location:
 - a. Style A, Straight: [Provide in areas with carpet]<Insert area requirements> .
 - b. Style B, Cove: [Provide in areas with resilient floor coverings]<Insert area requirements> .
- 5. Minimum Thickness: [0.125 inch (3.2 mm)][0.080 inch (2.0 mm)]<Insert dimension> .
- 6. Height: [2-1/2 inches (64 mm)][4 inches (102 mm)][6 inches (152 mm)][As indicated on Drawings] .
- 7. Lengths: [Cut lengths 48 inches (1219 mm) long][Coils in manufacturer's standard length][Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length] .
- 8. Outside Corners: [Job formed][Preformed][Job formed or preformed] .
- 9. Inside Corners: [Job formed][Preformed][Job formed or preformed] .
- 10. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's sample]<Insert colors and patterns> .

2.3 RESILIENT STAIR ACCESSORIES

A. Rubber Stair Treads :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [American Biltrite]
 - b. [Flexco Corporation]
 - c. [Mannington Mills, Inc]
 - d. [Mohawk Group]
 - e. [Roppe Corporation; Roppe Holding Company]
 - f. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 - g. [The R.C. Musson Rubber Co.]
 - h. [VPI Corporation]
 - i. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Biltrite]
 - b. [Flexco Corporation]
 - c. [Mannington Mills, Inc]
 - d. [Mohawk Group]
 - e. [Roppe Corporation; Roppe Holding Company]
 - f. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 - g. [The R.C. Musson Rubber Co.]
 - h. [VPI Corporation]
 - i. <Insert manufacturer's name>
- 3. Classification: ASTM F2169, Type [TS (rubber, vulcanized thermoset)][or][TP (rubber,

thermoplastic)] .

- a. Class: [1 (smooth, flat)][2 (pattern; embossed, grooved, or ribbed)] .
 - b. Group: [1 (embedded abrasive strips)][2 (with contrasting color for the visually impaired)] .
4. Nosing Style: [Square, adjustable to cover angles between 60 and 90 degrees][Square][Round] .
 5. Nosing Height: [1-1/2 inches (38 mm)][2 inches (51 mm)][2-3/16 inches (56 mm)]<Insert dimension> .
 6. Thickness: [1/4 inch (6 mm) and tapered to back edge]<Insert thickness> .
 7. Size: Lengths and depths to fit each stair tread in [one piece][one piece or, for treads exceeding maximum lengths manufactured, in equal-length units] .

B. Vinyl Stair Treads :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Flexco Corporation]
 - b. [Roppe Corporation; Roppe Holding Company]
 - c. [Tarkett USA]
 - d. [VPI Corporation]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Flexco Corporation]
 - b. [Roppe Corporation; Roppe Holding Company]
 - c. [Tarkett USA]
 - d. [VPI Corporation]
 - e. <Insert manufacturer's name>
3. Classification: ASTM F2169, Type TV (vinyl, thermoplastic).
 - a. Class: [1 (smooth, flat)][2 (pattern; embossed, grooved, or ribbed)] .
 - b. Group: [1 (embedded abrasive strips)][2 (with contrasting color for the visually impaired)] .
4. Nosing Style: [Square, adjustable to cover angles between 60 and 90 degrees][Square][Round] .
5. Nosing Height: [1-1/2 inches (38 mm)][2 inches (51 mm)][2-3/16 inches (56 mm)]<Insert dimension> .
6. Thickness: [1/4 inch (6 mm) and tapered to back edge]<Insert thickness> .
7. Size: Lengths and depths to fit each stair tread in [one piece][one piece or, for treads exceeding maximum lengths manufactured, in equal-length units] .

C. Integral Risers: Smooth, flat; in height that fully covers substrate.

D. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer who produced treads and recommended by manufacturer for installation with treads.

1. Style: **[Coved toe, 7 inches (178 mm) high by length matching treads][Toeless, by length matching treads]** .
2. Thickness: **[0.125 inch (3.2 mm)][Manufacturer's standard]<Insert thickness>** .

E. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers, produced by same manufacturer who produced treads, and recommended by manufacturer for installation with treads.

1. Thickness: **[0.125 inch (3.2 mm)][0.080 inch (2.0 mm)][Manufacturer's standard]<Insert thickness>** .

F. Landing Tile: **[Matching treads; produced by same manufacturer who produced treads and recommended by manufacturer for installation with treads]<Insert requirements>** .

G. Locations: **[Provide resilient stair accessories in areas indicated on Drawings]<Insert area requirements>** .

H. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample]<Insert colors and patterns>** .

2.4 RESILIENT MOLDING ACCESSORIES

A. Rubber Molding Accessories :

1. Accessory Description: **[Stair-tread nosing][cap for cove carpet][cap for cove resilient floor covering][carpet bar for tackless installations][carpet edge for glue-down applications][nosing for carpet][nosing for resilient floor covering][reducer strip for resilient floor covering][joiner for tile and carpet][transition strips]<Insert description>** .
2. Profile and Dimensions: **[As indicated on Drawings]<Insert profile and dimensions>** .

B. Vinyl Molding Accessories :

1. Accessory Description: **[Stair-tread nosing][cap for cove carpet][cap for cove resilient floor covering][carpet bar for tackless installations][carpet edge for glue-down applications][nosing for carpet][nosing for resilient floor covering][reducer strip for resilient floor covering][joiner for tile and carpet][transition strips]<Insert description>** .
2. Profile and Dimensions: **[As indicated on Drawings]<Insert profile and dimensions>** .

C. Locations: **[Provide resilient molding accessories in areas indicated on Drawings]<Insert area requirements>** .

D. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample]<Insert colors and patterns>** .

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended in writing by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Nominal **2 inches (51 mm)** wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
1. Material: **[Extruded aluminum with mill finish]<Insert material>** .
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces in accordance with ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with

installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than [9][10]<Insert number> pH.

4. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area> , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate> in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 INSTALLATION OF RESILIENT BASE

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than [3 inches (76 mm)]<Insert dimension> in length.
 - a. Form without producing discoloration (whitening) at bends.
 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than [3 inches (76 mm)]<Insert dimension> in length.

- a. [Miter][Cope][Miter or cope] corners to minimize open joints.

3.4 INSTALLATION OF RESILIENT STAIR ACCESSORIES

- A. Comply with manufacturer's written instructions for installing resilient stair accessories.
- B. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
- C. Tightly adhere to substrates throughout length of each piece.
- D. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.5 INSTALLATION OF RESILIENT MOLDING ACCESSORIES

- A. Comply with manufacturer's written instructions for installing resilient molding accessories.
- B. Butt resilient molding accessories to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.6 CLEANING

- A. Comply with manufacturer's written instructions for cleaning resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply [one][two][three]<Insert number> coat(s).

3.7 PROTECTION

- A. Comply with manufacturer's written instructions for protecting resilient products.
- B. After post-installation cleaning, immediately protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- C. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13 00



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SECTION 09 65 13 13 - CORK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cork floor tile.
2. Engineered cork floor tile.
3. Cork rubber floor tile.
4. Cork floating floor system.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Cork floor tile.
2. Engineered cork floor tile.
3. Cork rubber floor tile.
4. Cork floating floor system.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
6. Environmental Product Declaration: For each product.
7. Health Product Declaration: For each product.
8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
9. Environmental Product Declaration: For each product.
10. Environmental Product Declaration: For each product.
11. Environmental Product Declaration: For each product.
12. Third-Party Certifications: For each product.
13. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For each type of cork flooring.

1. Include cork flooring layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: Full-size units of each type, color, pattern, and finish of cork flooring required.

E. Samples for Initial Selection: For each type of cork flooring indicated.

- F. Samples for Verification: Full-size units of each type, color, pattern, and finish of cork flooring required.
- G. Product Schedule: For cork flooring. [**Use same designations indicated on Drawings.**]

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of cork flooring to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cork Flooring: Furnish one box for every [50]<Insert number> boxes or fraction thereof, of each type, color, pattern, and finish of cork flooring installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. Size: Minimum **100 sq. ft. (9.3 sq. m)** for each cork flooring type, color, pattern, and finish, **[in locations indicated][in locations directed by Architect]<Insert locations>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store cork flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**. Store cork flooring on flat surfaces.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **[65 deg F (18 deg C)]<Insert temperature>** or more than **[75 deg F (24 deg C)]<Insert temperature>** where relative humidity is between 45 and 65 percent, in spaces to receive cork flooring during the following periods:
 - 1. 72 hours before installation.
 - 2. During installation.
 - 3. 72 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range

recommended by manufacturer, but not less than [65 deg F (18 deg C)]<Insert temperature> or more than [75 deg F (24 deg C)]<Insert temperature>.

- C. Close spaces to traffic during cork flooring installation.
- D. Close spaces to traffic for 72 hours after cork flooring installation.
- E. Install cork flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For cork flooring, as determined by testing identical products in accordance with ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- E. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 CORK FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[Expanko Resilient Flooring; a Stonehard brand]**
 - 2. **[Globus Cork]**
 - 3. **[Jelinek Cork Group]**
 - 4. **[Nova Distinctive Floors]**
 - 5. **[WE Cork Inc.]**
 - 6. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Expanko Resilient Flooring; a Stonehard brand]**
 2. **[Globus Cork]**
 3. **[Jelinek Cork Group]**
 4. **[Nova Distinctive Floors]**
 5. **[WE Cork Inc.]**
 6. **<Insert manufacturer's name>**
- C. Composition: 100 percent natural cork bark and recycled cork granules and set in a natural or synthetic, flexible resin matrix; homogeneous and uniform in composition throughout the tile thickness.
- D. Nominal Density: **[Manufacturer's standard][30 lb/cu. ft. (480 kg/cu. m), minimum][34 lb/cu. ft. (544 kg/cu. m), minimum][37 lb/cu. ft. (592 kg/cu. m), minimum]<Insert density>**.
- E. Nominal Thickness: **[0.156 inch (4.0 mm)][0.180 inch (4.8 mm)][0.312 inch (8.0 mm)]<Insert dimension>**.
- F. Nominal Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][24 by 24 inches (610 by 610 mm)]<Insert dimensions>**.
- G. Color: **[Light natural][Medium natural][Dark natural][As indicated by manufacturer's designations][Match Architect's sample]<Insert color>**.
- H. Factory Finish: **[Sanded or unfinished][Waxed][Polyurethane][Polyurethane containing UV inhibitors][Acrylic][As indicated by manufacturer's designations][Match Architect's sample]<Insert finish>**.

2.3 ENGINEERED CORK FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Expanko Resilient Flooring; a Stonehard brand]**
 2. **[Jelinek Cork Group]**
 3. **[Nova Distinctive Floors]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Expanko Resilient Flooring; a Stonehard brand]**
 2. **[Jelinek Cork Group]**
 3. **[Nova Distinctive Floors]**
 4. **<Insert manufacturer's name>**
- C. Composition: 100 percent natural cork bark and recycled cork granules with laminated, patterned cork veneers and set in a natural or synthetic, flexible resin matrix; homogeneous and uniform in composition throughout the tile thickness.
- D. Nominal Density: **[Manufacturer's standard][30 lb/cu. ft. (480 kg/cu. m), minimum][34 lb/cu. ft. (544 kg/cu. m), minimum][37 lb/cu. ft. (592 kg/cu. m), minimum]<Insert density>**.

- E. Nominal Thickness: [0.156 inch (4.0 mm)][0.180 inch (4.8 mm)][0.312 inch (8.0 mm)]<Insert dimension>.
- F. Nominal Size: [12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][24 by 24 inches (610 by 610 mm)]<Insert dimensions>.
- G. Color: [Light natural][Medium natural][Dark natural][As indicated by manufacturer's designations][Match Architect's sample]<Insert color>.
- H. Pattern: [As indicated by manufacturer's designations][Match Architect's sample]<Insert pattern>.
- I. Factory Finish: [Sanded or unfinished][Waxed][Polyurethane][Polyurethane containing UV inhibitors][Acrylic][As indicated by manufacturer's designations][Match Architect's sample]<Insert finish>.

2.4 CORK RUBBER FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [Expanko Resilient Flooring; a Stonehard brand]
 - 2. [Zandur]
 - 3. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [Expanko Resilient Flooring; a Stonehard brand]
 - 2. [Zandur]
 - 3. <Insert manufacturer's name>
- C. Composition: Natural cork granules mixed with rubber granules combined with fade-resistant pigments; homogeneous and uniform in composition throughout the tile thickness. Minimum 60 percent recycled or renewable content.
 - 1. Minimum Tensile Strength: 700 psi (4.8 MPa).
- D. Nominal Thickness: [0.098 inch (2.5 mm)][0.125 inch (3.2 mm)][0.138 inch (3.5 mm)]<Insert dimension>.
- E. Size: [12 by 24 inches (305 by 610 mm)][20 by 20 inches (508 by 508 mm)][24 by 24 inches (610 by 610 mm)][40 by 40 inches (1016 by 1016 mm)]<Insert dimensions>.
- F. Texture: [Smooth][Lightly textured wear surface]<Insert texture>.
- G. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>.

2.5 CORK FLOATING FLOOR SYSTEM

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be

incorporated into the Work include, but are not limited to, the following]:

1. [Expanko Resilient Flooring; a Stonehard brand]
 2. [Globus Cork]
 3. [Jelinek Cork Group]
 4. [Nova Distinctive Floors]
 5. [WE Cork Inc.]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Expanko Resilient Flooring; a Stonehard brand]
 2. [Globus Cork]
 3. [Jelinek Cork Group]
 4. [Nova Distinctive Floors]
 5. [WE Cork Inc.]
 6. <Insert manufacturer's name>
- C. Construction: Laminated planks made of two cork layers, top and bottom, that sandwich a medium-density fiberboard core.
- D. Plank Density:
1. Cork Top Layer: [28 lb/cu. ft. (448 kg/cu. m)][Manufacturer's standard density]<Insert density>.
 2. Interlocking Medium-Density Fiberboard Core: [45 lb/cu. ft. (720 kg/cu. m)][Manufacturer's standard density]<Insert density>.
 3. Cork Underlayment Layer: [13 lb/cu. ft. (208 kg/cu. m)][Manufacturer's standard density]<Insert density>.
- E. Plank Thickness: [0.450-inch (11.4-mm)][Manufacturer's standard]<Insert thickness> overall nominal thickness made up as follows:
1. Cork Top Layer: [0.125-inch (3.2-mm)][Manufacturer's standard]<Insert thickness> nominal thickness.
 2. Interlocking Medium-Density Fiberboard Core: [0.250-inch (6.3-mm)][Manufacturer's standard]<Insert thickness> nominal thickness.
 3. Cork Underlayment Layer: [0.078-inch (2.0-mm)][Manufacturer's standard]<Insert thickness> nominal thickness.
- F. Plank Size: [36 by 12 inches (900 by 305 mm)]<Insert dimensions>.
- G. Plank Edge: [Tongue-and-groove type][Manufacturer's standard interlock].
- H. Color: [Light natural][Medium natural][Dark natural][As indicated by manufacturer's designations][Match Architect's sample]<Insert color>.
- I. Pattern: [As indicated by manufacturer's designations][Match Architect's sample]<Insert pattern>.
- J. Factory Finish: [Sanded or unfinished][Waxed][Polyurethane][Polyurethane containing UV inhibitors][Acrylic][As indicated by manufacturer's designations][Match Architect's sample]<Insert finish>.

2.6 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by cork flooring manufacturer for applications indicated.
- B. Vapor Retarder: ASTM D4397, polyethylene sheet not less than **[6.0 mils (0.15 mm)]**[8.0 mils (0.2 mm)] thick.
- C. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit cork flooring and substrate conditions indicated.
- D. Adhesives shall have a VOC content of **[50]**<Insert value> g/L or less.
 - 1. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.7 FIELD-APPLIED FINISHES

- A. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- F. Sealer: Product as recommended by cork flooring manufacturer.
- G. Paste Wax: Products as recommended by cork flooring manufacturer.
- H. Finish Coatings: Products[**containing UV inhibitors**] as recommended by cork flooring manufacturer.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of cork flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to cork flooring manufacturer's written instructions to ensure adhesion of cork flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by cork flooring manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by cork flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **[9][10]<Insert number>** pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate>** in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **[75]<Insert number>** percent relative humidity level measurement.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

- E. Do not install cork flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 72 hours in advance of installation, move cork flooring products and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by cork flooring.

3.3 INSTALLATION OF FLOOR TILE

- A. Comply with manufacturer's written instructions for installing cork flooring.
- B. Mix together floor tiles from each carton to ensure uniform distribution of shade.
- C. Discard broken, cracked, chipped, or deformed floor tiles.
- D. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- E. Lay floor tiles **[square with room axis][at a 45-degree angle with room axis][in ashlar or staggered joint pattern][in pattern indicated]<Insert requirements>**.
- F. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- G. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- I. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of appearance between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- J. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 INSTALLATION OF CORK FLOATING FLOOR SYSTEM

- A. Comply with manufacturer's written instructions for installing cork floating floor system.
- B. Install continuous vapor retarder over substrate, taping side and end laps.
- C. Mix floor planks from several cartons to ensure uniform distribution of shade.
- D. Discard broken, cracked, chipped, or deformed floor planks.
- E. Do not attach floor planks to substrate.

- F. Tightly interlock and adhere plank edges with adhesive. Remove excess adhesive from top surface of planks.
- G. Lay floor planks [in pattern indicated]<Insert requirements>.
- H. Use spacers to keep floor planks from shifting as subsequent rows are added. Remove spacers after installing cork floating floor system.
- I. Maintain expansion space at walls and other obstructions and terminations of flooring [as indicated on Drawings][of not less than 3/8 inch (9.5 mm)]<Insert dimension>.
- J. Extend floor planks into toe spaces, door reveals, closets, and similar openings. Extend floor planks to center of door openings.
- K. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor planks as marked on substrates. Use chalk or other nonpermanent marking device.

3.5 FIELD-APPLIED FINISHING

- A. Apply finishes according to cork flooring manufacturer's written instructions.
- B. Apply cork sealer in [one][two]<Insert number> coat(s).
- C. Apply paste wax in [one][two][three]<Insert number> coat(s).
- D. Apply finish coating in [two][three]<Insert number> coat(s).

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting cork flooring.
- B. Perform the following operations immediately after completing cork flooring installation:
 - 1. Remove blemishes from surfaces.
 - a. Remove installation adhesive from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect cork flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover cork flooring until Substantial Completion.

END OF SECTION 09 65 13 13



Task	Specification	Specification Description
09 65 13 13	09 65 13 00	Resilient Base and Accessories
09 65 13 23	09 65 13 13	Cork Flooring
09 65 13 23	09 65 13 00	Resilient Base and Accessories
09 65 13 33	01 11 19 00	No Specification Required
09 65 13 33	09 65 13 13	Cork Flooring
09 65 13 33	09 65 13 00	Resilient Base and Accessories
09 65 13 33	09 65 16 00	Resilient Sheet Flooring
09 65 13 33	09 65 43 00	Linoleum Flooring
09 65 13 36	09 65 13 13	Cork Flooring
09 65 13 36	09 65 13 00	Resilient Base and Accessories



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SECTION 09 65 16 00 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Unbacked vinyl sheet flooring.
2. Vinyl sheet flooring with backing.
3. Unbacked rubber sheet flooring.
4. Rubber sheet flooring with backing.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient sheet flooring.
3. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference [at **Project site**][by web conference]<Insert location>.

1. Review methods and procedures related to resilient sheet flooring installation including, but not limited to, the following:
 - a. Delivery, storage, and handling procedures.
 - b. Ambient conditions and ventilation procedures.
 - c. Subfloor preparation procedures.
 - d. <Insert agenda items>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Shop Drawings: For each type of resilient flooring type required.

1. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: For each resilient flooring product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than [6-by-9-inch (152-by-230-mm)]<Insert dimensions> sections.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than **[9 inches (230 mm)]<Insert dimension>** long, of each color required.
 - D. Samples for Initial Selection: For each type of resilient flooring product required.
 - E. Samples for Verification: For each type of resilient flooring product, in manufacturer's standard size, but not less than **[6-by-9-inch (152-by-230-mm)]<Insert dimensions>** sections of each color, texture, and pattern required.
 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than **[9 inches (230 mm)]<Insert dimension>** long, of each color required.
 - F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient flooring product, color, and pattern required; with seam running lengthwise and in center of **[6-by-9-inch (152-by-230-mm)]<Insert dimensions>** Sample applied to a rigid backing and prepared by Installer for this Project.
 - G. Product Schedule: For each type of resilient flooring product required. **[Use same designations indicated on Drawings.]**
 - H. Sustainable Design Submittals:
 1. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
 2. Product Data: For installation adhesives, indicating VOC content.
 3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
 4. Environmental Product Declaration (EPD): For each product.
 5. Health Product Declaration (HPD): For each product.
 6. Environmental Product Declaration (EPD): For each product.
 7. Health Product Declaration (HPD): For each product.
 8. Environmental Product Declaration (EPD): For each product.
 9. Environmental Product Declaration (EPD): For each product.
 10. Environmental Product Declaration (EPD): For each product.
 11. Third-Party Certifications: For each product.
 12. Third-Party-Certified Life-Cycle Assessment: For each product.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: For resilient sheet flooring, for tests performed by a qualified testing agency.
 - B. Qualification Data: For Installer.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For each type of resilient sheet flooring to include:
 1. Methods for maintaining resilient sheet flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to resilient sheet flooring.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Sheet Flooring: Full-width rolls equal to **[5]<Insert number>** percent of amount installed for each type, color, and pattern indicated, but not less than **10 sq. yd. (8.3 sq. m)**.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming methods indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups **[as indicated on Drawings]<Insert mockup requirements>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturers' labels indicating brand name and directions for storing.
- B. Store resilient sheet flooring and accessory materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**. Store rolls upright.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install resilient flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install resilient flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient flooring manufacturer.
- C. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer,

but not less than [70 deg F (21 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature>, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.

2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F (13 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature>.
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 RESILIENT SHEET FLOORING

- A. Unbacked Vinyl Sheet Flooring : Resilient sheet flooring product with wear layer that is printed or decorated, composed of fillers, pigments, and vinyl binders[, and **protected by a clear specialty performance top layer**].
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Armstrong Flooring, Inc.]
 - b. [Forbo Flooring Systems]
 - c. [Gerflor USA]
 - d. [Mannington Mills, Inc]
 - e. [Roppe Corporation; Roppe Holding Company]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Armstrong Flooring, Inc.]**
 - b. **[Forbo Flooring Systems]**
 - c. **[Gerflor USA]**
 - d. **[Mannington Mills, Inc]**
 - e. **[Roppe Corporation; Roppe Holding Company]**
 - f. **<Insert manufacturer's name>**
3. Classification: ASTM F1913.
 4. Thickness: **[0.080 inch (2.0 mm)]<Insert dimension>**.
 5. Wearing Surface: **[Smooth][Embossed]**.
 6. Sheet Width: **[As standard with manufacturer][6 ft. (1.8 m)][6.6 ft. (2.0 m)]<Insert dimension>**.
 7. Seamless Installation Method: **[Heat welded][Chemically bonded]<Insert requirements>**.
 8. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>**.
- B. Vinyl Sheet Flooring with Backing : Resilient sheet flooring product with wear layer that is printed or decorated, composed of fillers, pigments, and vinyl binders[, **and protected by a clear specialty performance top layer**] with backing.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Altro]**
 - b. **[Armstrong Flooring, Inc.]**
 - c. **[Congoleum Flooring]**
 - d. **[Forbo Flooring Systems]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Altro]**
 - b. **[Armstrong Flooring, Inc.]**
 - c. **[Congoleum Flooring]**
 - d. **[Forbo Flooring Systems]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **<Insert manufacturer's name>**
 3. Classification: ASTM F1303, Type **[I, minimum binder content of 90 percent][II, minimum binder content of 34 percent]**, Grade 1.

- a. Overall Thickness: **[As standard with manufacturer]<Insert dimension>**.
 - b. Interlayer Material: **[Foamed plastic][None]**.
 - c. Backing Class: **[A (fibrous)][B (nonfoamed plastic)][C (foamed plastic)]**.
4. Wearing Surface: **[Smooth][Embossed][with embedded abrasives]**.
 5. Sheet Width: **[As standard with manufacturer][5 ft. (1.5 m)][6 ft. (1.8 m)][6.6 ft. (2.0 m)][12 ft. (3.6 m)]<Insert dimension>**.
 6. Seamless Installation Method: **[Heat welded][Chemically bonded]<Insert requirements>**.
 7. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>**.
- C. Unbacked Rubber Sheet Flooring : Resilient sheet flooring product with vulcanized rubber wear layer that is colored or patterned.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Biltrite]**
 - b. **[Flexco Corporation]**
 - c. **[Mannington Mills, Inc]**
 - d. **[Mondo]**
 - e. **[Nora by Interface]**
 - f. **[Roppe Corporation; Roppe Holding Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Biltrite]**
 - b. **[Flexco Corporation]**
 - c. **[Mannington Mills, Inc]**
 - d. **[Mondo]**
 - e. **[Nora by Interface]**
 - f. **[Roppe Corporation; Roppe Holding Company]**
 - g. **<Insert manufacturer's name>**
 3. Classification: ASTM F1859, Type **[I, homogeneous rubber sheet floor covering][II, heterogeneous (layered) rubber sheet floor covering]**.
 4. Thickness: **[As standard with manufacturer]<Insert dimension>**.
 5. Hardness: **[Not less than required by ASTM F1859][Manufacturer's standard hardness, measured using Shore, Type A durometer in accordance with ASTM D2240]**.
 6. Wearing Surface: **[Smooth][Textured][Molded pattern]**.
 7. Molded-Pattern Figure: **[Raised discs][Raised squares]<Insert pattern>**.
 8. Sheet Width: **[As standard with manufacturer][3.0 ft. (0.9 m)][3.3 ft. (1.0 m)][4.0 ft. (1.2 m)][5 ft. (1.5 m)][6.3 ft. (1.9 m)]<Insert dimension>**.
 9. Seamless Installation Method: **[Heat welded][Chemically bonded]<Insert requirements>**.
 10. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>**.
- D. Rubber Sheet Flooring with Backing : Resilient sheet flooring product with vulcanized rubber wear layer that is colored or patterned and backing.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Nora by Interface]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Nora by Interface]**
 - b. **<Insert manufacturer's name>**
3. Classification: ASTM F1860, Type **[I, Homogeneous][II, Heterogeneous]**.
4. Wear-Layer Thickness: **[As standard with manufacturer]<Insert dimension>**.
5. Overall Thickness: **[As standard with manufacturer]<Insert dimension>**.
6. Interlayer Material: **[As standard with manufacturer][None]**.
7. Backing: **[Grade 1, Fibrous][Grade 2, Foamed rubber]**.
8. Hardness: **[Not less than required by ASTM F1860][Manufacturer's standard hardness, measured using Shore, Type A durometer in accordance with ASTM D2240]**.
9. Wearing Surface: **[Smooth][Textured][Molded pattern]**.
10. Sheet Width: **[As standard with manufacturer][3.3 ft. (1.0 m)]<Insert dimension>**.
11. Seamless Installation Method: **[Heat welded][Chemically bonded]<Insert requirements>**.
12. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>**.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended in writing by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- C. Seamless Installation Accessories:
 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Colors: **[As selected by Architect from manufacturer's full range to contrast with**

flooring][Match flooring]<Insert colors>.

2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: **1-inch (25-mm)** radius provided or approved by resilient sheet flooring manufacturer.
2. Cap Strip: **[Square metal, vinyl, or rubber cap][Tapered vinyl cap]<Insert requirements>** provided or approved by resilient sheet flooring manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.

- E. Floor Polish:** Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.**
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.**
1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.**
- B. Concrete Substrates:** Prepare in accordance with ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **[9][10]<Insert number>** pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft.**

(1.36 kg of water/92.9 sq. m)]<Insert rate> in 24 hours.

- b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 INSTALLATION OF RESILIENT SHEET FLOORING

- A. Comply with manufacturer's written installation instructions.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least **6 inches (152 mm)** away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections

permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

- J. Integral-Flash-Cove Base: Cove resilient sheet flooring [6 inches (152 mm)][to dimension indicated]<Insert dimension> up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
1. Apply [one][two][three]<Insert number> coat(s).
- E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16 00



Task	Specification	Specification Description
09 65 16 23	09 65 13 13	Cork Flooring
09 65 16 23	09 65 16 00	Resilient Sheet Flooring



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SECTION 09 65 19 00 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tiles.
2. Commercial luxury vinyl floor tiles.
3. Commercial luxury vinyl floor planks.
4. Rigid polymeric core floor tiles.
5. Rigid polymeric core floor planks.
6. Rubber floor tiles.
7. Vinyl composition floor tiles.
8. Resilient terrazzo floor tiles.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient tile and plank flooring.
3. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.

1.2 DEFINITIONS

- A. LVP: Luxury vinyl planks. A marketing term that is applied to modular resilient floor plank products.
- B. LVT: Luxury vinyl tiles. A marketing term that is applied to modular resilient floor tile products.
- C. VCT: Vinyl composition tiles. A modular resilient floor tile product composed of binder, fillers, and pigments.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site][by web conference]<Insert location>** .
1. Review methods and procedures related to resilient tile and plank flooring installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of specified product.

1. Include manufacturers' written data on physical characteristics, durability, and fade resistance.
2. Include manufacturers' written installation instructions for each type of substrate.

B. Shop Drawings: For each type of resilient flooring type required.

1. Include flooring layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: Full-size units of each color, texture, and pattern of resilient flooring type required.

D. Samples for Initial Selection: For each type of resilient flooring product required.

E. Samples for Verification: Full-size units of each color and pattern of resilient flooring type required.

F. Product Schedule: For each type of resilient flooring product required. [**Use same designations indicated on Drawings.**]

G. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
3. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
4. Product Data: For adhesives, indicating VOC content.
5. Environmental Product Declaration (EPD): For each product.
6. Health Product Declaration (HPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Health Product Declaration (HPD): For each product.
9. Environmental Product Declaration (EPD): For each product.
10. Environmental Product Declaration (EPD): For each product.
11. Environmental Product Declaration (EPD): For each product.
12. Third-Party Certifications: For each product.
13. Third-Party-Certified Life-Cycle Assessment: For each product.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports:** For resilient flooring, for tests performed by a qualified testing agency.
- B. Qualification Statements:** For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient flooring product type to include the following:

1. Methods for maintaining resilient flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to resilient flooring.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials [, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Tile and Plank Flooring: Furnish no fewer than [**1 box for each 50 boxes**]<Insert **quantity**> or fraction thereof, of each type, color, pattern, and size of resilient flooring product installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required.

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups [**as indicated on Drawings**]<Insert mockup requirements> .
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturers' labels indicating brand name and directions for storing.
- B. Store resilient flooring and accessory materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**. Store resilient flooring on flat surfaces.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install resilient flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install resilient flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient flooring manufacturer.
- C. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer,

but not less than [70 deg F (21 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature> , in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.

2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F (13 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature> .
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

1.12 WARRANTY

- A. Special Warranty for Resilient Flooring Products: Manufacturer agrees to repair or replace components of flooring installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of flooring due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Warranty Period: [10]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

- G. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Verify adhesive has a VOC content of [50][70]<Insert number> g/L or less.

2.2 RESILIENT TILE AND PLANK FLOORING

- A. Solid Vinyl Floor Tiles : Resilient tile flooring product composed of binder, fillers, and pigments compounded with suitable stabilizers and processing aids.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Flexco Corporation]**
 - d. **[Mohawk Group]**
 - e. **[Roppe Corporation; Roppe Holding Company]**
 - f. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - g. **[van Gelder, Inc]**
 - h. **[VPI Corporation]**
 - i. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Flexco Corporation]**
 - d. **[Mohawk Group]**
 - e. **[Roppe Corporation; Roppe Holding Company]**
 - f. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - g. **[van Gelder, Inc]**
 - h. **[VPI Corporation]**
 - i. **<Insert manufacturer's name>**
 - 3. Classification: ASTM F1700, Class **[I, Monolithic Vinyl Tile][II, Surface-Decorated Vinyl Tile][III, Printed Film Vinyl Tile][As indicated by product designations]** .
 - a. Type: **[A, Smooth Surface][B, Embossed Surface]** .
 - 4. Thickness: **[0.080 inch (2.0 mm)][0.100 inch (2.5 mm)][0.120 inch (3.0 mm)][0.125 inch (3.2 mm)]<Insert dimension>** .
 - 5. Size: **[12 by 12 inches (305 by 305 mm)][18 by 18 inches (457 by 457 mm)][24 by 24 inches (610 by 610 mm)][36 by 36 inches (914 by 914 mm)][3 by 36 inches (76 by 914 mm)]<Insert dimensions>** .
 - 6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 - 7. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.

- B. Commercial Luxury Vinyl Floor Tiles : Solid, resilient tile flooring product composed of binder, fillers, and pigments compounded with suitable stabilizers and processing aids; marketed as luxury vinyl tiles (LVT).
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Armstrong Flooring, Inc.]**
 - d. **[Flexco Corporation]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **[Tarkett USA]**
 - k. **[van Gelder, Inc]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Armstrong Flooring, Inc.]**
 - d. **[Flexco Corporation]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **[Tarkett USA]**
 - k. **[van Gelder, Inc]**
 - l. **<Insert manufacturer's name>**
 3. Classification: ASTM F1700, Class **[II, Surface-Decorated Vinyl Tile][III, Printed Film Vinyl Tile]** .
 - a. Type: **[A, Smooth Surface][B, Embossed Surface]** .
 4. Overall Thickness: **[0.080 inch (2.0 mm)][0.100 inch (2.5 mm)][0.120 inch (3.0 mm)][0.125 inch (3.2 mm)]<Insert dimension>** including manufacturer's standard clear wear layer and UV-cured polyurethane topcoat.
 5. Nominal Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][18 by 18 inches (457 by 457 mm)][24 by 24 inches (610 by 610 mm)][36 by 36 inches (914 by 914 mm)][3 by 36 inches (76 by 914 mm)][6 by 48 inches (150 by 1220 mm)][9 by 60 inches (230 by 1525 mm)]<Insert dimensions>** .
 6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

- C. Commercial Luxury Vinyl Floor Planks : Solid, resilient plank flooring product composed of binder, fillers, and pigments compounded with suitable stabilizers and processing aids; marketed as luxury vinyl planks (LVP).
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Armstrong Flooring, Inc.]**
 - d. **[Flexco Corporation]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **[Tarkett USA]**
 - k. **[van Gelder, Inc]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Altro]**
 - b. **[American Biltrite]**
 - c. **[Armstrong Flooring, Inc.]**
 - d. **[Flexco Corporation]**
 - e. **[Gerflor USA]**
 - f. **[Mannington Mills, Inc]**
 - g. **[Mohawk Group]**
 - h. **[Roppe Corporation; Roppe Holding Company]**
 - i. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - j. **[Tarkett USA]**
 - k. **[van Gelder, Inc]**
 - l. **<Insert manufacturer's name>**
 3. Classification: ASTM F1700, Class III, Printed Film Vinyl Tile.
 - a. Type: **[A, Smooth Surface][B, Embossed Surface]** .
 4. Overall Thickness: **[0.080 inch (2.0 mm)][0.100 inch (2.5 mm)][0.120 inch (3.0 mm)][0.125 inch (3.2 mm)]<Insert dimension>** including manufacturer's standard clear wear layer and UV-cured polyurethane topcoat.
 5. Nominal Size: **[12 by 12 inches (305 by 305 mm)][12 by 24 inches (305 by 610 mm)][18 by 18 inches (457 by 457 mm)][24 by 24 inches (610 by 610 mm)][36 by 36 inches (914 by 914 mm)][3 by 36 inches (76 by 914 mm)][6 by 48 inches (150 by 1220 mm)][9 by 60 inches (230 by 1525 mm)]<Insert dimensions>** .
 6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- D. Rigid Polymeric Core Floor Tiles : Resilient flooring product with rigid polymeric core that is surface-

decorated or -printed and protected by a clear wear layer [, **marketed as luxury vinyl tiles (LVT),**] with worked edges that allow the product to be joined or butted together to form a larger integral unit.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Biltrite]**
 - b. **[Gerflor USA]**
 - c. **[Mannington Mills, Inc]**
 - d. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - e. **[Tarkett USA]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Biltrite]**
 - b. **[Gerflor USA]**
 - c. **[Mannington Mills, Inc]**
 - d. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - e. **[Tarkett USA]**
 - f. **<Insert manufacturer's name>**
3. Classification: ASTM F3261, Class I, printed with clear transparent/translucent wear layer.
 - a. Type: **[A, Smooth Surface][B, Embossed Surface]** .
 - b. Grade: **[1][2]** .
 - c. Backing Class: **[A, no attached underlay backing][B, with attached underlay backing]** .
4. Overall Thickness: **[0.2 inch (5 mm)][0.236 inch (6 mm)][0.25 inch (6.5 mm)][0.28 inch (7 mm)]<Insert dimension>** including manufacturer's standard clear wear layer and UV-cured polyurethane topcoat.
5. Nominal Size: **[6 by 48 inches (152 by 1219 mm)][7 by 60 inches (178 by 1524 mm)][8.85 by 60 inches (225 by 1524 mm)][9 by 60 inches (225 by 1524 mm)][9 by 72 inches (229 by 1829 mm)]<Insert dimensions>** .
6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

E. Rigid Polymeric Core Floor Planks : Resilient flooring product with rigid polymeric core that is surface-decorated or -printed and protected by a clear wear layer [, **marketed as luxury vinyl planks (LVP),**] with worked edges that allow the product to be joined or butted together to form a larger integral unit.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[American Biltrite]**
 - b. **[Gerflor USA]**
 - c. **[Mannington Mills, Inc]**

- d. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - e. **[Tarkett USA]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Biltrite]**
 - b. **[Gerflor USA]**
 - c. **[Mannington Mills, Inc]**
 - d. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - e. **[Tarkett USA]**
 - f. **<Insert manufacturer's name>**
 3. Classification: ASTM F3261, Class I, printed with clear transparent/translucent wear layer.
 - a. Type: **[A, Smooth Surface][B, Embossed Surface]** .
 - b. Grade: **[1][2]** .
 - c. Backing Class: **[A, no attached underlay backing][B, with attached underlay backing]** .
 4. Overall Thickness: **[0.2 inch (5 mm)][0.236 inch (6 mm)][0.25 inch (6.5 mm)][0.28 inch (7 mm)]<Insert dimension>** including manufacturer's standard clear wear layer and UV-cured polyurethane topcoat.
 5. Nominal Size: **[6 by 48 inches (152 by 1219 mm)][7 by 60 inches (178 by 1524 mm)][8.85 by 60 inches (225 by 1524 mm)][9 by 60 inches (225 by 1524 mm)][9 by 72 inches (229 by 1829 mm)]<Insert dimensions>** .
 6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- F. Rubber Floor Tiles : Resilient flooring product consisting of modular rubber tiles with smooth square edges.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Allstate Flooring]**
 - b. **[Altro]**
 - c. **[American Biltrite]**
 - d. **[Flexco Corporation]**
 - e. **[Mannington Mills, Inc]**
 - f. **[Mondo]**
 - g. **[Nora by Interface]**
 - h. **[PRF USA Inc]**
 - i. **[Roppe Corporation; Roppe Holding Company]**
 - j. **[Tarkett USA]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Allstate Flooring]**
 - b. **[Altro]**
 - c. **[American Biltrite]**
 - d. **[Flexco Corporation]**
 - e. **[Mannington Mills, Inc]**
 - f. **[Mondo]**
 - g. **[Nora by Interface]**
 - h. **[PRF USA Inc]**
 - i. **[Roppe Corporation; Roppe Holding Company]**
 - j. **[Tarkett USA]**
 - k. **<Insert manufacturer's name>**
 3. Classification: ASTM F1344, Type **[I-A, Homogeneous Rubber Tile, solid color][I-B, Homogeneous Rubber Tile, through mottled][II-A, Heterogeneous (Layered) Rubber Tile, solid-color wear layer][II-B, Heterogeneous (Layered) Rubber Tile, mottled wear layer]** .
 4. Hardness: **[Grade 1, minimum hardness of 85][Grade 2, minimum hardness of 70][Manufacturer's standard hardness]** , when measured using Shore, Type A durometer in accordance with ASTM D2240.
 5. Wearing Surface: **[Smooth][Embossed][Molded pattern]** .
 - a. Molded-Pattern Figure: **[Raised discs][Raised squares]<Insert pattern>** .
 6. Thickness: **[0.125 inch (3.2 mm)]<Insert dimension>** .
 7. Size: **[12 by 12 inches (305 by 305 mm)][24 by 24 inches (610 by 610 mm)]<Insert dimensions>** .
 8. Seamless-Installation Method: **[Heat welded][Chemically bonded]<Insert requirements>** .
 9. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 10. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- G. Vinyl Composition Floor Tiles : Resilient flooring product composed of binder, fillers, and pigments compounded with suitable stabilizers and processing aids.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Armstrong Flooring, Inc.]**
 - b. **[Tarkett USA]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong Flooring, Inc.]**
 - b. **[Tarkett USA]**
 - c. **<Insert manufacturer's name>**
 3. Classification: ASTM F1066, Class **[1, solid color][2, through pattern][3, surface pattern]** .
 4. Wearing Surface: **[Smooth][Embossed]** .
 5. Thickness: **[0.125 inch (3.2 mm)]<Insert dimension>** .
 6. Size: **12 by 12 inches (305 by 305 mm)**.

7. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .
 8. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- H. Resilient Terrazzo Floor Tiles: Marble or granite chips embedded in flexible, thermoset-polyester-resin matrix; electrically nonconductive and chemical, oil, and corrosion resistive, with smooth wearing surface and manufacturer's standard factory-applied, protective coating.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Floorazzo Tile, LLC]**
 - b. **[Nurrazzo]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Floorazzo Tile, LLC]**
 - b. **[Nurrazzo]**
 - c. **<Insert manufacturer's name>**
 3. Thickness: **[1/8 inch (3.0 mm)][3/16 inch (4.8 mm)]** .
 4. Size: **[12 by 12 inches (305 by 305 mm)][24 by 24 inches (610 by 610 mm)][24 by 48 inches (610 by 1219 mm)]** .
 5. Seamless-Installation Method: Chemically bonded.
 6. Accessories:
 - a. Base: **[3 inches (76 mm)][4 inches (102 mm)][6 inches (152 mm)]** tall.
 - 1) Type: **[Sanitary, coved][Straight]** .
 - b. Divider strips.
 7. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>** .

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended in writing by floor tile and adhesive manufacturers for substrate and conditions indicated.
 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical

- Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- C. Vapor Retarder: ASTM D4397, polyethylene sheet not less than **[6.0 mils (0.15 mm)][8.0 mils (0.2 mm)]** thick.
- D. Asphalt-Saturated Felt: ASTM D4869/D4869M, Type II.
- E. Seamless-Installation Accessories: Manufacturer's standard product for chemically bonding seams.
- F. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.
- G. Joint Sealant for Resilient Terrazzo Floor Tile: Silicone sealant of type and grade recommended in writing by floor tile manufacturer to suit application.
1. Joint-Sealant Color: **[White][As selected by Architect from manufacturer's full range to match floor tile][Match floor tile]<Insert color>** .
 2. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify the building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- H. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Products recommended by floor tile manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written installation instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring manufacturer. Do not use solvents.
 - 3. Alkalinity Testing: Perform pH testing in accordance with ASTM F710. Proceed with installation only if pH readings are not less than **[7.0]<Insert value>** and not greater than **[8.5]<Insert value>**.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>** and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate>** in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **[75]<Insert number>** percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- E. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF RESILIENT TILE AND PLANK FLOORING

- A. Comply with manufacturer's written installation instructions.
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles **[square with room axis][at a 45-degree angle with room axis][in pattern indicated]<Insert requirements>**.
- D. Tile Matching: Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered.
 - 1. Lay tiles **[with grain running in one direction][with grain direction alternating in adjacent tiles (basket-weave pattern)][in pattern of colors and sizes indicated]**.

- E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- I. Adhered Floor Tile: Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written installation instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times, to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- J. Floating Floor Tile: Install LVT floor tiles in accordance with flooring manufacturer's written installation instructions.
- K. Seamless Installation: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- L. Resilient Terrazzo Accessories: Install in accordance with manufacturer's written instructions.

3.4 CLEANING

- A. Comply with manufacturer's written instructions for cleaning flooring.
- B. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
 - 1. Apply [one][two][three]<Insert requirements> coat(s).
- D. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- E. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Sealer: Apply two base coats of liquid sealer.
 - 2. Finish: Apply [two][three]<Insert requirements> coats of liquid floor finish.

- a. Apply finish in accordance with manufacturer's written installation instructions to produce a sealed surface that is ready for use. Do not cover flooring after finishing until finish reaches full cure.

3.5 PROTECTION

- A. Comply with manufacturer's written instructions for protecting flooring.
- B. After post-installation cleaning, immediately protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- C. Cover resilient flooring until Substantial Completion.

END OF SECTION 09 65 19 00



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Task	Specification	Specification Description
09 65 19 19	09 65 13 13	Cork Flooring
09 65 19 19	09 65 19 00	Resilient Tile Flooring
09 65 19 23	09 65 13 13	Cork Flooring
09 65 19 23	09 65 19 00	Resilient Tile Flooring
09 65 19 33	09 65 13 13	Cork Flooring
09 65 19 33	09 65 19 00	Resilient Tile Flooring
09 65 19 43	09 65 13 13	Cork Flooring
09 65 19 43	09 65 19 00	Resilient Tile Flooring
09 65 23 00	09 65 13 13	Cork Flooring
09 65 23 00	09 65 16 00	Resilient Sheet Flooring



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SECTION 09 65 43 00 - LINOLEUM FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linoleum tile flooring.
2. Linoleum sheet flooring.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with linoleum flooring.
3. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
4. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference [at Project site][by web conference]<Insert location>.

1. Review methods and procedures related to linoleum flooring installation including, but not limited to, the following:
 - a. Delivery, storage, and handling procedures.
 - b. Ambient conditions and ventilation procedures.
 - c. Subfloor preparation procedures.
 - d. <Insert agenda items>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Shop Drawings: For each type of linoleum flooring.

1. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: For each exposed product and for each color and pattern specified in manufacturer's standard size, but not less than [6-by-9-inch (152-by-230-mm)]<Insert dimensions> sections.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than [9 inches (230 mm)]<Insert dimension> long, of each color required.

- D. Samples for Initial Selection: For each type of linoleum flooring indicated.
- E. Samples for Verification: For each type of linoleum flooring, in manufacturer's standard size, but not less than **[6-by-9-inch (152-by-230-mm)]<Insert dimensions>** sections of each different color and pattern required.
 - 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than **[9 inches (230 mm)]<Insert dimension>** long, of each color required.
- F. Heat-Welded Seam Samples: For each linoleum flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of **[6-by-9-inch (152-by-230-mm)]<Insert dimensions>** Sample applied to rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For linoleum flooring. **[Use same designations indicated on Drawings.]**
- H. Sustainable Design Submittals:
 - 1. Product Data: For installation adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
 - 4. Environmental Product Declaration (EPD): For each product.
 - 5. Health Product Declaration (HPD): For each product.
 - 6. Environmental Product Declaration (EPD): For each product.
 - 7. Health Product Declaration (HPD): For each product.
 - 8. Environmental Product Declaration (EPD): For each product.
 - 9. Environmental Product Declaration (EPD): For each product.
 - 10. Environmental Product Declaration (EPD): For each product.
 - 11. Third-Party Certifications: For each product.
 - 12. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For linoleum flooring, for tests performed by a qualified testing agency.
- B. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of linoleum flooring.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, **[from the same production run,]** to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile Flooring: Furnish one box for every **[50]<Insert number>** boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Sheet Flooring: Furnish not less than **[10 linear ft. (3 linear m)]<Insert dimension>** for every **[500 linear ft. (150 linear m)]<Insert dimension>** or fraction thereof, in roll form and in full roll

width for each type, color, and pattern of sheet flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for linoleum flooring installation and seaming methods indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by flooring manufacturer for installation techniques required.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups [**as indicated on Drawings**]**<Insert mockup requirements>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **65 deg F (18 deg C)** or more than **90 deg F (32 deg C)**.
 - 1. Tile Flooring: Store on flat surfaces.
 - 2. Sheet Flooring: Store rolls upright.

1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **[70 deg F (21 deg C)]<Insert temperature>** or more than **[95 deg F (35 deg C)]<Insert temperature>**, in spaces to receive flooring during the following periods:
 - 1. 72 hours before installation.
 - 2. During installation.
 - 3. 72 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than **[55 deg F (13 deg C)]<Insert temperature>** or more than **[95 deg F (35 deg C)]<Insert temperature>**.
- C. Close spaces to traffic during flooring installation.
- D. Close spaces to traffic for 72 hours after flooring installation.
- E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS
2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For linoleum flooring, as determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 LINOLEUM FLOORING

- A. Linoleum Tile Flooring:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Forbo Flooring Systems]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Forbo Flooring Systems]**
 - b. **<Insert manufacturer's name>**
 - 3. Classification: ASTM F2195, Type **[I, linoleum floor tile with fibrous backing][II, linoleum floor tile with special backing][III, linoleum floor tile without backing]**.
 - 4. Nominal Floor Tile Size: **[Manufacturer's standard][13 by 13 inches (330 by 330 mm)][20 by 20 inches (500 by 500 mm)][24 by 24 inches (610 by 610 mm)]<Insert size>**.
 - 5. Thickness: **[0.08 inch (2.0 mm)][0.10 inch (2.5 mm)]<Insert dimension>**.
 - 6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>**.
- B. Linoleum Sheet Flooring:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[Forbo Flooring Systems]**
 - b. **[Gerflor USA]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Forbo Flooring Systems]**
 - b. **[Gerflor USA]**
 - c. **<Insert manufacturer's name>**
3. Classification: ASTM F2034, Type **[I, linoleum sheet with backing][III, linoleum sheet with special backing]**.
4. Roll Size: In manufacturer's standard length, but not less than **[78 inches (1980 mm)]<Insert dimension>** wide.
5. Thickness: **[0.080 inch (2.0 mm)][0.10 inch (2.5 mm)][0.125 inch (3.2 mm)][0.137 inch (3.5 mm)]<Insert dimension>**.
6. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample]<Insert colors and patterns>**.

2.3 ACCESSORY MATERIALS

- A. Heat-Welding Bead: For seamless installation, solid-strand product of linoleum flooring manufacturer.
1. Colors: **[As selected by Architect from manufacturer's full range to contrast with linoleum flooring][Match linoleum flooring]<Insert colors>**.
- B. Integral-Flash-Cove-Base Accessories:
1. Cove Strip: **1-inch (25-mm)** radius, provided or approved by flooring manufacturer.
 2. Cap Strip: **[Square metal, vinyl, or rubber cap][Tapered vinyl cap]<Insert requirements>** provided or approved by flooring manufacturer.
- C. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- D. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.
1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of

formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

- E. Floor Polish: Provide protective, liquid floor-polish products recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of linoleum flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with flooring manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than [9][10]<Insert number> pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate> in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install linoleum flooring until materials are the same temperature as space where they are to be installed.

1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 INSTALLATION OF LINOLEUM FLOORING, GENERAL

- A. Comply with manufacturer's written instructions for installing linoleum flooring.
- B. Scribe and cut linoleum flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, thresholds, door frames, and nosings.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on linoleum flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- E. Install linoleum flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- F. Adhere linoleum flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: For seamless installation, comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 INSTALLATION OF LINOLEUM TILE FLOORING

- A. Lay out linoleum tile flooring from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay floor tiles **[square with room axis][at a 45-degree angle with room axis][in pattern indicated]<Insert requirements>**.
- B. Match linoleum floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
 1. Lay floor tiles **[with grain running in one direction][with grain direction alternating in adjacent floor tiles (basket-weave pattern)][in pattern of colors and sizes indicated]<Insert requirements>**.

3.5 INSTALLATION OF LINOLEUM SHEET FLOORING

- A. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out linoleum sheet flooring as follows:

1. Maintain uniformity of flooring direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least **6 inches (152 mm)** away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
- C. Integral-Flash-Cove Base: Cove flooring [**6 inches (152 mm)**][**to dimension indicated**]<Insert **dimension**> up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting linoleum flooring.
- B. Perform the following operations immediately after completing linoleum flooring installation:
1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect linoleum flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from linoleum flooring surfaces before applying liquid floor polish.
1. Apply [**two**][**three**]<Insert **requirements**> coat(s).
- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

END OF SECTION 09 65 43 00



Task	Specification	Specification Description
09 65 43 00	09 65 13 13	Cork Flooring
09 65 43 00	09 65 16 00	Resilient Sheet Flooring



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SECTION 09 65 66 00 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient athletic tile flooring.
2. Resilient athletic sheet flooring.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient athletic flooring.

1.2 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts and junction boxes for gymnasium and fitness equipment.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review methods and procedures related to resilient athletic flooring installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. **<Insert agenda items>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

- B. Shop Drawings: Show installation details and locations of the following:

1. Border tiles.
2. Floor patterns.
3. Layout, colors, widths, and dimensions of game lines and markers.
4. Locations of floor inserts for athletic equipment installed through flooring.
5. Locations of junction boxes for fitness equipment installed through flooring.
6. Seam locations for resilient athletic sheet flooring.

- C. Samples: For each exposed product and for each type, color, and pattern specified, [6-inch- (150-mm-)]<Insert dimension> square in size and of the same thickness indicated for the Work.
 - 1. Game-Line- and Marker-Paint Samples: Include Sample sets showing game-line- and marker-paint colors applied to flooring.
 - 2. Seam Samples: For each type of resilient athletic sheet flooring color and pattern required; with seam running lengthwise and in center of [6-by-9-inch (150-by-230-mm)]<Insert dimensions> Sample applied to a rigid backing and prepared by Installer for this Project.
- D. Samples for Initial Selection: For each type of resilient athletic flooring.
 - 1. Game-Line and Marker Paint: Include charts showing available colors and glosses.
- E. Samples for Verification: For each type, color, and pattern of flooring specified, [6-inch- (150-mm-)]<Insert dimension> square in size and of same thickness and material indicated for the Work.
 - 1. Game-Line- and Marker-Paint Samples: Include Sample sets showing game-line- and marker-paint colors applied to flooring.
 - 2. Seam Samples: For each type of resilient athletic sheet flooring color and pattern required; with seam running lengthwise and in center of [6-by-9-inch (150-by-230-mm)]<Insert dimensions> Sample applied to a rigid backing and prepared by Installer for this Project.
- F. Product Schedule: For resilient athletic flooring. Use same designations indicated on Drawings.
- G. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
 - 2. Laboratory Test Reports: Verify compliance with VOC emissions evaluation.
 - 3. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 - 4. Product Data: For adhesives, indicating VOC content.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For resilient athletic flooring, for tests performed by a qualified testing agency.
- B. Qualification Statements: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resilient athletic flooring.
 - 1. Methods for maintaining resilient athletic flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to resilient athletic flooring.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Athletic Tile Flooring: Furnish no fewer than [**1 box for each 50 boxes**]<Insert quantity> or fraction thereof, of each type, color, pattern, and size of tile flooring installed.
 - 2. Resilient Athletic Sheet Flooring: Furnish full-width rolls of not less than [**10 linear feet (3 linear m) for each 500 linear feet (150 linear m)**]<Insert quantity> or fraction thereof, of each type, color, and pattern of sheet flooring installed.

1.8 QUALITY ASSURANCE

- A. Resilient Athletic Sheet Flooring Installer Qualifications: An experienced installer who has completed resilient athletic sheet flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup [**as indicated on Drawings**]<Insert mockup requirements>.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration.
 - 1. Store tiles on flat surfaces.
 - 2. Store rolls upright.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install resilient athletic flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install resilient athletic flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient athletic flooring manufacturer.

C. Adhesively Applied Products:

1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than [70 deg F (21 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature>, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F (13 deg C)]<Insert temperature> or more than [95 deg F (35 deg C)]<Insert temperature>.
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- C. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- F. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 1. Verify adhesive has a VOC content of [50][70]<Insert number> g/L or less.

2.2 RESILIENT ATHLETIC TILE FLOORING

- A. Interlocking, Rubber Floor Tile : Resilient athletic flooring consisting of modular rubber tiles with precision cut, interlocking edges, for free-lay installation.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Action Floor Systems, LLC]
 - b. [Amarco Products]
 - c. [American Floor Products Company, Inc]
 - d. [Connor Sports]
 - e. [Dinoflex]
 - f. [Flexco Corporation]
 - g. [Horner Sports Flooring]
 - h. [Johnsonite; a Tarkett company]
 - i. [Mateflex]
 - j. [Mondo]
 - k. [Pawling Corporation]
 - l. [REGUPOL AMERICA, LLC]
 - m. [Robbins Sports Surfaces]
 - n. [Roppe Corporation; Roppe Holding Company]
 - o. [Tarkett Sports; a division of the Tarkett Group]
 - p. [van Gelder, Inc]
 - q. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Action Floor Systems, LLC]
 - b. [Amarco Products]
 - c. [American Floor Products Company, Inc]
 - d. [Connor Sports]
 - e. [Dinoflex]
 - f. [Flexco Corporation]
 - g. [Horner Sports Flooring]
 - h. [Johnsonite; a Tarkett company]
 - i. [Mateflex]
 - j. [Mondo]
 - k. [Pawling Corporation]
 - l. [REGUPOL AMERICA, LLC]
 - m. [Robbins Sports Surfaces]
 - n. [Roppe Corporation; Roppe Holding Company]
 - o. [Tarkett Sports; a division of the Tarkett Group]
 - p. [van Gelder, Inc]
 - q. <Insert manufacturer's name>

3. Material: [Rubber][Recycled-rubber compound].
4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
5. Tile Interlock: [Visible][Hidden].
6. Traffic-Surface Texture: [Smooth][Nondirectional, stipple texture][Textured]<Insert texture>.
7. Provide reversible tiles (with traffic-surface texture on both sides).
8. Size: [Manufacturer's standard-size square tile][24 inches (610 mm) square]<Insert dimension>.
9. Thickness: [3/8 inch (9.5 mm)][7/16 inch (11.1 mm)][1/2 inch (13 mm)][9/16 inch (14.3 mm)][3/4 inch (19 mm)]<Insert dimension>.
10. Weight: Not less than <Insert weight> per tile.

11. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>**.

12. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.

a. Border Color and Pattern: **[Matching floor tile][As selected by Architect from manufacturer's full range to contrast with floor tile][As indicated by manufacturer's designations]<Insert color and pattern>**.

B. Rubber Floor Tile : Resilient athletic flooring consisting of modular rubber tiles with smooth square edges for adhered application.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Aacer Sports Flooring, an Infinity Wood Floors Company]**
- b. **[Action Floor Systems, LLC]**
- c. **[Amarco Products]**
- d. **[American Floor Products Company, Inc]**
- e. **[Connor Sports]**
- f. **[Dinoflex]**
- g. **[Flexco Corporation]**
- h. **[Horner Sports Flooring]**
- i. **[Johnsonite; a Tarkett company]**
- j. **[Mateflex]**
- k. **[Matter Surfaces]**
- l. **[Mondo]**
- m. **[Nora by Interface]**
- n. **[REGUPOL AMERICA, LLC]**
- o. **[Robbins Sports Surfaces]**
- p. **[Roppe Corporation; Roppe Holding Company]**
- q. **[Sport Court, a Gerflor Company]**
- r. **[Tarkett Sports; a division of the Tarkett Group]**
- s. **[The R.C. Musson Rubber Co.]**
- t. **[van Gelder, Inc]**
- u. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Aacer Sports Flooring, an Infinity Wood Floors Company]**
- b. **[Action Floor Systems, LLC]**
- c. **[Amarco Products]**
- d. **[American Floor Products Company, Inc]**
- e. **[Connor Sports]**
- f. **[Dinoflex]**
- g. **[Flexco Corporation]**
- h. **[Horner Sports Flooring]**
- i. **[Johnsonite; a Tarkett company]**
- j. **[Mateflex]**
- k. **[Matter Surfaces]**

- l. **[Mondo]**
 - m. **[Nora by Interface]**
 - n. **[REGUPOL AMERICA, LLC]**
 - o. **[Robbins Sports Surfaces]**
 - p. **[Roppe Corporation; Roppe Holding Company]**
 - q. **[Sport Court, a Gerflor Company]**
 - r. **[Tarkett Sports; a division of the Tarkett Group]**
 - s. **[The R.C. Musson Rubber Co.]**
 - t. **[van Gelder, Inc]**
 - u. **<Insert manufacturer's name>**
3. Material: **[Rubber][Recycled-rubber compound][Rubber wear layer and rubber shock-absorbent layer, vulcanized together]<Insert description>**.
 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
 5. Traffic-Surface Texture: **[Smooth][Nondirectional, stipple texture][Textured]<Insert description>**.
 6. Size: **[Manufacturer's standard-size square tile][18 inches (457 mm) square][24 inches (610 mm) square][36 inches (914 mm) square]<Insert dimension>**.
 7. Thickness: **[5/32 inch (4 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (13 mm)]<Insert dimension>**.
 8. Weight: Not less than **<Insert weight>** per tile.
 9. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>**.
 10. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.
 - a. Border Color and Pattern: **[Matching floor tile][As selected by Architect from manufacturer's full range to contrast with floor tile][As indicated by manufacturer's designations]<Insert color and pattern>**.
- C. Rubber-Strip Floor Tile : Modular, close-nap, carpetlike tiles of rubber-fabric strips; made from recycled tires; bonded to a backing; for adhered installation.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Flexco Corporation]**
 - d. **[Johnsonite; a Tarkett company]**
 - e. **[The R.C. Musson Rubber Co.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Flexco Corporation]**
 - d. **[Johnsonite; a Tarkett company]**
 - e. **[The R.C. Musson Rubber Co.]**

- f. **<Insert manufacturer's name>**
 3. Materials: Recycled rubber.
 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
 5. Fire-Test-Response Characteristics: Passing 16 CFR 1630 (DOC FF-1-70).
 6. Size: **12 inches (305 mm)** square.
 7. Thickness: **3/8 inch (9.5 mm)**.
 8. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>**.
- D. Rubber Mats : Individual rubber mats specifically designed for free-lay athletic flooring applications.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Matter Surfaces]**
 - d. **[Pawling Corporation]**
 - e. **[The R.C. Musson Rubber Co.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Matter Surfaces]**
 - d. **[Pawling Corporation]**
 - e. **[The R.C. Musson Rubber Co.]**
 - f. **<Insert manufacturer's name>**
 3. Material: Recycled-rubber compound.
 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
 5. Traffic-Surface Texture: Smooth.
 6. Size: **[48 by 72 inches (1219 by 1829 mm)]<Insert dimensions>**.
 7. Thickness: **[3/8 inch (9.5 mm)][1/2 inch (13 mm)]<Insert dimension>**.
 8. Color: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color>**.
- E. Interlocking, Suspended, Polymer Floor Tile : Athletic flooring consisting of modular, polymer tiles raised above substrate on gusseted ribs or posts; with hidden, interlocking connectors; for free-lay installation **[over adhered rubber sheet underlayment]**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amarco Products]**

- b. **[Mateflex]**
 - c. **[Matter Surfaces]**
 - d. **[Sport Court, a Gerflor Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amarco Products]**
 - b. **[Mateflex]**
 - c. **[Matter Surfaces]**
 - d. **[Sport Court, a Gerflor Company]**
 - e. **<Insert manufacturer's name>**
 3. Material: **[Solid polypropylene][Polypropylene supports with vinyl insert]<Insert material>**.
 4. Tile Interlock: Manufacturer's standard.
 5. Traffic-Surface Texture: **[Solid][Raised disc]<Insert texture>**.
 6. Size: **[Manufacturer's standard-size square tile][12 inches (305 mm) square][9.8 inches (250 mm) square]<Insert dimension>**.
 7. Thickness: **[1/2 inch (13 mm)]<Insert dimension>**.
 8. Weight: Not less than **<Insert weight>** per tile.
 9. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>**.
 10. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.
 - a. Border Color and Pattern: **[Matching floor tile][As selected by Architect from manufacturer's full range to contrast with floor tile][As indicated by manufacturer's designations]<Insert color and pattern>**.
- F. Interlocking, Open-Grid, Vinyl Floor Tile : Athletic flooring consisting of modular, polymer tiles with openings to permit free drainage of water; with hidden, interlocking connectors; for free-lay installation.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Mateflex]**
 - d. **[Matter Surfaces]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amarco Products]**
 - b. **[American Floor Products Company, Inc]**
 - c. **[Mateflex]**
 - d. **[Matter Surfaces]**
 - e. **<Insert manufacturer's name>**

3. Material: **[Vinyl][Recycled-vinyl compound]<Insert description>**.
4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
5. Tile Interlock: Manufacturer's standard.
6. Size: **12 inches (305 mm)** square.
7. Thickness: **[1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][7/16 inch (11.1 mm)][3/4 inch (19 mm)]<Insert dimension>**.
8. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>**.
9. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.
 - a. Border Color and Pattern: **[Matching floor tile][As selected by Architect from manufacturer's full range to contrast with floor tile][As indicated by manufacturer's designations]<Insert color and pattern>**.

2.3 RESILIENT ATHLETIC SHEET FLOORING

- A. Rubber Sheet Flooring : Rubber athletic flooring provided as rolled goods for adhered installation.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aacer Sports Flooring, an Infinity Wood Floors Company]**
 - b. **[Action Floor Systems, LLC]**
 - c. **[Amarco Products]**
 - d. **[American Floor Products Company, Inc]**
 - e. **[Connor Sports]**
 - f. **[Flexco Corporation]**
 - g. **[Horner Sports Flooring]**
 - h. **[Johnsonite; a Tarkett company]**
 - i. **[Mondo]**
 - j. **[Nora by Interface]**
 - k. **[REGUPOL AMERICA, LLC]**
 - l. **[Robbins Sports Surfaces]**
 - m. **[Roppe Corporation; Roppe Holding Company]**
 - n. **[Sport Court, a Gerflor Company]**
 - o. **[Surface America, Inc.]**
 - p. **[Tarkett Sports; a division of the Tarkett Group]**
 - q. **[van Gelder, Inc]**
 - r. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aacer Sports Flooring, an Infinity Wood Floors Company]**
 - b. **[Action Floor Systems, LLC]**
 - c. **[Amarco Products]**
 - d. **[American Floor Products Company, Inc]**
 - e. **[Connor Sports]**

- f. [Flexco Corporation]
 - g. [Horner Sports Flooring]
 - h. [Johnsonite; a Tarkett company]
 - i. [Mondo]
 - j. [Nora by Interface]
 - k. [REGUPOL AMERICA, LLC]
 - l. [Robbins Sports Surfaces]
 - m. [Roppe Corporation; Roppe Holding Company]
 - n. [Sport Court, a Gerflor Company]
 - o. [Surface America, Inc.]
 - p. [Tarkett Sports; a division of the Tarkett Group]
 - q. [van Gelder, Inc]
 - r. <Insert manufacturer's name>
3. Material: [Recycled-rubber compound][Rubber wear layer and rubber shock-absorbent layer, vulcanized together]<Insert description>.
 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
 5. Traffic-Surface Texture: [Smooth]<Insert description>.
 6. Roll Size: [Not less than 48 inches (1219 mm)]<Insert dimension> wide by longest length that is practical to minimize splicing during installation.
 7. Thickness: [1/4 inch (6.4 mm)][3/8 inch (9.5 mm)]<Insert dimension>.
 8. Color and Pattern: [As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>.
 9. Border: Interlocking, beveled-edge tiles, of same material as sheet flooring; with bevels that transition from thickness of sheet flooring to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.
 - a. Border Color and Pattern: [Matching sheet flooring][As selected by Architect from manufacturer's full range to contrast with floor tile][As indicated by manufacturer's designations]<Insert color and pattern>.
- B. Sheet Vinyl Flooring : Sheet vinyl flooring specifically designed for adhered athletic flooring applications.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Aacer Sports Flooring, an Infinity Wood Floors Company]
 - b. [Action Floor Systems, LLC]
 - c. [Amarco Products]
 - d. [Connor Sports]
 - e. [Gerflor USA]
 - f. [Johnsonite; a Tarkett company]
 - g. [Lonseal, Inc]
 - h. [Matter Surfaces]
 - i. [Mondo]
 - j. [Tarkett Sports; a division of the Tarkett Group]
 - k. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Aacer Sports Flooring, an Infinity Wood Floors Company]

- b. [Action Floor Systems, LLC]
 - c. [Amarco Products]
 - d. [Connor Sports]
 - e. [Gerflor USA]
 - f. [Johnsonite; a Tarkett company]
 - g. [Lonseal, Inc]
 - h. [Matter Surfaces]
 - i. [Mondo]
 - j. [Tarkett Sports; a division of the Tarkett Group]
 - k. <Insert manufacturer's name>
3. Unbacked Sheet Vinyl Flooring: ASTM F1913, [0.08 inch (2 mm)]<Insert dimension> thick.
- a. Separate underlayment pad of bonded recycled rubber and polyurethane particles.
4. Sheet Vinyl Flooring with Backing: ASTM F1303.
- a. Type (Binder Content): [Type I, minimum binder content of 90 percent][Type II, minimum binder content of 34 percent].
 - b. Wear-Layer Thickness: Grade 1.
 - c. Overall Thickness: <Insert dimension>.
 - d. Interlayer Material: [Foamed plastic][None].
 - e. Backing Class: [Class B (nonfoamed plastic)][Class C (foamed plastic)].
5. Seaming Method: [Heat welded][Chemically bonded].
6. Traffic-Surface Texture: [Smooth][Embossed]<Insert description>.
7. Applied Finish: [Factory-applied UV urethane][Field-applied polyurethane]<Insert description>.
8. Roll Size: [Not less than 48 inches (1219 mm)]<Insert dimension> wide by longest length that is practical to minimize splicing during installation.
9. Color and Pattern: [As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color and pattern>.

2.4 ACCESSORIES

- A. Underlayment: [Manufacturer's standard rubber sheet][Recycled-rubber sheet].
- 1. Thickness: [0.08 inch (2 mm)][0.12 inch (3 mm)]<Insert dimension>.
 - 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- B. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- C. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
- 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- D. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.
- E. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- G. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written installation instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity Testing: Perform pH testing in accordance with ASTM F710. Proceed with installation only if pH readings are not less than [7.0]<Insert value> and not greater than [8.5]<Insert value>.
 3. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area> and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft.

(1.36 kg of water/92.9 sq. m)]<Insert rate> in 24 hours.

- b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.

- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF RESILIENT ATHLETIC FLOORING, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 INSTALLATION OF RESILIENT ATHLETIC TILE FLOORING

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles [square with room axis][at a 45-degree angle with room axis][in pattern indicated]<Insert requirements>.
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Tile Matching: Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.
 - 1. Lay tiles [with grain running in one direction][with grain direction alternating in adjacent tiles (basket-weave pattern)][in pattern of colors and sizes indicated].
- D. Adhered Floor Tile: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written installation instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- E. Free-Lay Tile: Place flooring at locations indicated with units securely interconnected and fully seated on substrate to form a smooth, level surface.

3.5 INSTALLATION OF RESILIENT ATHLETIC SHEET FLOORING

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out sheet flooring as follows:
 1. Maintain uniformity of flooring direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least **6 inches (150 mm)** away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Locate seams in accordance with approved Shop Drawings.
- C. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written installation instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- D. Vinyl Sheet Flooring Seams: Prepare and finish seams to produce surfaces flush with adjoining flooring surfaces.
 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless flooring.
 2. Chemically Bonded Seams: Comply with ASTM F693. Seal seams to prevent openings from forming between cut edges and to prevent penetration of dirt, liquids, and other substances into seams.

3.6 GAME LINES AND MARKERS

- A. Mask flooring at game lines and markers and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.
- B. Apply game lines and markers in widths and colors in accordance with **[requirements indicated on Drawings]<Insert name of sport association publication>**.

3.7 FIELD-APPLIED FINISHES

- A. Apply finish after game-line and marker paint is fully cured.
- B. Apply finish in accordance with manufacturer's written installation instructions to produce a sealed surface that is ready for use.
- C. Do not cover flooring after finishing until finish reaches full cure.

3.8 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
1. Remove adhesive and other blemishes from flooring surfaces.
 2. Sweep and vacuum flooring thoroughly.
 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 65 66 00

SECTION 09 65 66 00A - FLUID-APPLIED ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyurethane flooring, fluid applied directly on substrates.
2. Polyurethane flooring, fluid applied over base mats.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with fluid-applied athletic flooring.
2. Section 096723 "Resinous Flooring" for polymer floor covering systems intended for other uses.

1.2 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Product Data: For paints and coatings, indicating VOC content.
5. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings: For flooring. Show installation details including layout, colors, widths, and dimensions of game lines and markers and locations of athletic equipment floor inserts.

- D. Samples: For each color, gloss, and texture of floor required, **12 inches (305 mm)** square, applied to a rigid backing.[**Include Sample sets showing the game-line- and marker-paint colors applied to the flooring.**]

- E. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for flooring[**and game-line and marker paints**].

- F. Samples for Verification: For each color, gloss, and texture of flooring required, **12 inches (305 mm)** square, applied to a rigid backing.[**Include Sample sets showing the game-line- and marker-paint**

colors applied to the flooring.]

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fluid-applied athletic flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is approved, trained, or certified by fluid-applied athletic flooring manufacturer.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with flooring manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting flooring application.
1. Do not apply flooring until spaces are enclosed and weatherproof; wet-work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete.
 2. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than **[70 deg F (21 deg C)]<Insert temperature>** or more than **[95 deg F (35 deg C)]<Insert temperature>**, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 3. After installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than **[55 deg F (13 deg C)]<Insert temperature>** or more than **[95 deg F (35 deg C)]<Insert temperature>**.
 4. Close spaces to traffic during flooring installation.

PART 2 - PRODUCTS

2.1 DIRECT-APPLIED FLOORING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Athletic Polymer Systems, Inc]**
2. **[Benyon Sports Surfaces; a Tarkett Sports Company]**
3. **[Surface America, Inc.]**
4. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's**

name; product name or designation> or comparable product by one of the following:

1. **[Athletic Polymer Systems, Inc]**
2. **[Benyon Sports Surfaces; a Tarkett Sports Company]**
3. **[Surface America, Inc.]**
4. **<Insert manufacturer's name>**

- C. Description: Fluid-applied athletic flooring system consisting of primer and polyurethane body and topcoats applied directly to substrate.
- D. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- G. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Materials:
1. Primer: Manufacturer's primer recommended for substrate indicated.
 2. Body Coat(s): Two-component, self-leveling, pigmented, polyurethane containing no rubber fillers and no mercury.
 3. Topcoat (Finish Coat): Manufacturer's standard pigmented polyurethane.
- J. Finishes:
1. Color: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color>**.
 2. Surface Texture: **[Manufacturer's standard]<Insert texture>**.

2.2 FLOORING APPLIED OVER BASE MATS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Aacer Sports Flooring, an Infinity Wood Floors Company]**
 2. **[Abacus Sports Installations Ltd.]**
 3. **[Action Floor Systems, LLC]**
 4. **[Benyon Sports Surfaces; a Tarkett Sports Company]**
 5. **[Connor Sports]**

6. [Horner Sports Flooring]
 7. [Robbins Sports Surfaces]
 8. [Sport Court, a Gerflor Company]
 9. [Surface America, Inc.]
 10. [Tarkett Sports; a division of the Tarkett Group]
 11. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Aacer Sports Flooring, an Infinity Wood Floors Company]
 2. [Abacus Sports Installations Ltd.]
 3. [Action Floor Systems, LLC]
 4. [Benyon Sports Surfaces; a Tarkett Sports Company]
 5. [Connor Sports]
 6. [Horner Sports Flooring]
 7. [Robbins Sports Surfaces]
 8. [Sport Court, a Gerflor Company]
 9. [Surface America, Inc.]
 10. [Tarkett Sports; a division of the Tarkett Group]
 11. <Insert manufacturer's name>
- C. Description: Fluid-applied athletic flooring system consisting of resilient base mat adhered to substrate, base mat sealer, and fluid-applied polyurethane body and topcoats.
- D. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- G. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Base Mat: Manufacturer's standard base mats of granulated recycled rubber in polyurethane binder.
1. Thickness: [5/32 inch (4 mm)][1/4 inch (6 mm)][9/32 inch (7 mm)][11/32 inch (9 mm)][15/32 inch (12 mm)]<Insert dimension>.
 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- J. Base-Mat Adhesive: Manufacturer's standard two-component polyurethane.

1. Adhesives shall have a VOC content of [60]<Insert value> g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- K. Base-Mat Sealer: Manufacturer's standard two-component polyurethane compound formulated for sealing base mat.
- L. Body Coat(s): Two-component, self-leveling, pigmented, polyurethane containing no rubber fillers and no mercury.
- M. Topcoat (Finish Coat): Manufacturer's standard pigmented polyurethane.
- N. Finishes:
1. Color: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's designations]<Insert color>.**
 2. Surface Texture: **[Manufacturer's standard]<Insert texture>.**

2.3 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.
1. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 4. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

5. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Concrete Substrates: Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Remove contaminants using mechanical means.
 2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than **[7.0]<Insert value>** and not greater than **[8.5]<Insert value>**.
 3. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate>** in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **[75]<Insert number>** percent relative humidity level measurement.
- B. Remove substrate coatings and other substances that are incompatible with flooring system components and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- D. Treat nonmoving substrate cracks and control joints to prevent cracks from telegraphing (reflecting) through flooring, according to manufacturer's written instructions.
- E. Protect substrate voids and joints to prevent flooring resins from flowing into or leaking through them.
- F. Move flooring installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.

1. Do not install flooring until it is same temperature as space where it is to be installed.

- G. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.
- H. Protect walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions during installation. Cover floor and wall areas at mixing stations.

3.3 FLOORING INSTALLATION, GENERAL

- A. Mix and apply flooring components according to manufacturer's written instructions.
 1. At substrate expansion, isolation, and other moving joints, install continuous joint of same width through flooring.

3.4 INSTALLATION OF DIRECT-APPLIED FLOORING

- A. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- B. Apply body coat(s) and topcoat to produce a uniform, level surface and finish.

3.5 INSTALLATION OF FLOORING APPLIED OVER BASE MATS

- A. Adhesively apply resilient base mats to substrate according to manufacturer's written instructions.
 1. Do not compress mats when fitting into place. Leave gap of width recommended in writing by manufacturer at butted base-mat sheets, walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions.
 2. Roll base mats to set them into adhesive and eliminate air pockets.
 3. Repair ridges at seams, loose areas, and air pockets according to manufacturer's written instructions.
- B. Apply seal coat to base mats before applying body coat(s).
- C. Smooth ridges and high spots in seal coat before applying body coat(s).
- D. Apply body coat(s) and topcoat to produce a uniform surface and finish.

3.6 GAME LINES AND MARKERS

- A. Mask flooring at game lines and markers, and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.
- B. Apply game lines and markers in widths and colors according to **[requirements indicated on Drawings]<Insert name of sport association publication>**.

3.7 PROTECTION

- A. Protect flooring from mars, marks, indentations, and other damage from construction operations and



placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 65 66 00A

SECTION 09 66 13 00 - PORTLAND CEMENT TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Poured-in-place portland cement terrazzo flooring.
2. Poured-in-place rustic terrazzo flooring.
3. Precast terrazzo units.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealants installed with terrazzo.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.
 - d. Review procedures for coping with unfavorable forecasted weather conditions.
 - e. **<Insert agenda items>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:

1. Divider strips.
2. Control-joint strips.
3. Expansion-joint strips.

4. Accessory strips.
5. Abrasive strips.
6. Stair treads, risers, and landings.
7. Precast terrazzo jointing and edge configurations.
8. Terrazzo patterns.
9. **<Insert requirements>**.

- D. Samples: For each exposed product and for each color and texture specified, **[6 inches (150 mm)]<Insert dimension>** in size.
- E. Samples for Initial Selection: NTMA's "Terrazzo Color Palette" showing the full range of colors and patterns available for each terrazzo type.
- F. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo Sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in sizes indicated below:
 1. Terrazzo: **[6-inch- (150-mm-)]<Insert dimension>** square Samples.
 2. Precast Terrazzo: **[6-inch- (150-mm-)]<Insert dimension>** square Samples.
 3. Accessories: **[6-inch- (150-mm-)]<Insert dimension>** long Samples of each exposed strip item required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is a contractor member of NTMA.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups for each type of terrazzo including accessories.
 - a. Size: Minimum **100 sq. ft. (9 sq. m)** of typical poured-in-place flooring condition for each color and pattern **[in locations indicated][in locations directed by Architect]<Insert location requirements>**.
 - b. Include **[base][first three stair treads]<Insert item>**.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Maintain interior ambient temperature above **50 deg F (10 deg C)** for 48 hours before and during terrazzo installation.
- B. Weather Limitations: Proceed with rustic terrazzo installation only when forecasted weather conditions permit work to be performed according to NTMA's written recommendations and when temperatures remain above **45 deg F (7.2 deg C)**.
- C. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- D. Provide permanent interior lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- E. Close spaces to traffic during terrazzo installation and for not less than 24 hours after installation unless manufacturer recommends a longer period.
- F. Control and collect water and dust produced by portland cement terrazzo grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.3 PORTLAND CEMENT TERRAZZO

- A. Portland Cement Terrazzo System <Insert designation>: [Sand cushion][Bonded][Monolithic].
 - 1. Underbed Thickness: [As indicated on Drawings]<Insert dimension>.
 - 2. Terrazzo Topping Thickness: [As indicated on Drawings]<Insert dimension>.
- B. Materials:

1. Portland Cement: ASTM C150/C150M, Type 1.
 - a. Color for Terrazzo Matrix: **[As required by mix indicated]<Insert requirements>**.
2. Water: Potable.
3. Sand: ASTM C33/C33M.
4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131/C131M[**and ASTM C535 for large-size coarse aggregates**].
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
6. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.
7. Underbed Bonding Agent: Neat portland cement paste.
8. Topping Bonding Agent: Neat portland cement paste, or epoxy or acrylic bonding agents formulated for use with monolithic terrazzo.
9. Underbed Reinforcement: Galvanized welded-wire reinforcement, wire **2 by 2 inches (51 by 51 mm) by 0.062 inch (1.57 mm)** in diameter, complying with ASTM A1064/A1064M, except for minimum wire size.
10. Isolation Membrane: Polyethylene sheeting, ASTM D2103, Type 13300, **4 mils (0.1 mm)** thick; or unperforated asphalt felt, ASTM D226/D226M, Type I (No. 15).

C. Mixes:

1. Underbed Mix: One part portland cement to four parts sand and sufficient water to provide workability at as low a slump as possible.
2. Terrazzo Topping Mix: One **94-lb (42.6-kg)** bag of portland cement per **[200 lb (90.7 kg)]<Insert value>** of aggregate, matrix pigment if required by mix color, and sufficient water to produce a workable mix.
 - a. Mix Color and Pattern: **[As selected by Architect from NTMA's "Terrazzo Color Palette" CI Series][As selected by Architect from NTMA's "Terrazzo Color Palette" CII Series][As selected by Architect from NTMA's "Terrazzo Color Palette" CIII Series][Match Architect's sample][Match existing]<Insert NTMA designation or custom mix>**.

2.4 RUSTIC TERRAZZO

A. Rustic Terrazzo System **<Insert designation>**: **[Bonded][Monolithic]**.

1. Underbed Thickness: **[As indicated on Drawings]<Insert dimension>**.
2. Terrazzo Topping Thickness: **[As indicated on Drawings]<Insert dimension>**.

B. Materials:

1. Portland Cement: ASTM C150/C150M, Type 1.
 - a. Color for Terrazzo Matrix: **[As required by mix indicated]<Insert requirements>**.

2. Water: Potable.
3. Sand: ASTM C33/C33M.
4. Aggregates: As required for mix indicated, in sizes comply with NTMA gradation standards, with maximum 24-hour absorption rate of 0.25 percent, and containing no deleterious or foreign matter.
5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
6. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight and weather, and compatible with matrix binder.
7. Air-Entraining Admixture: ASTM C260/C260M.
8. Underbed Bonding Agent: Neat portland cement paste.
9. Topping Bonding Agent: Neat portland cement paste, or epoxy or acrylic bonding agents formulated for use with topping indicated.

C. Mixes:

1. Underbed Mix: One part portland cement to four parts sand and sufficient water to provide workability at as low a slump as possible and air entrainment agent to produce 6 percent plus or minus 1 percent air content at point of delivery.
2. Terrazzo Topping Mix: One **94-lb (42.6-kg)** bag of portland cement per **[200 lb (90.7 kg)]<Insert value>** of aggregate, matrix pigment if required by mix color, and sufficient water to produce a workable mix.
 - a. Mix Color and Pattern: **[As selected by Architect from NTMA's "Terrazzo Color Palette" CI Series][As selected by Architect from NTMA's "Terrazzo Color Palette" CII Series][As selected by Architect from NTMA's "Terrazzo Color Palette" CIII Series][Match Architect's sample][Match existing]<Insert NTMA designation or custom mix>**.

2.5 PRECAST TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Precast Terrazzo Enterprises, Inc]**
 2. **[Romoco Precast Terrazzo Products; a subsidiary of Roman Mosaic & Tile Company]**
 3. **[Wausau Tile, Inc.]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Precast Terrazzo Enterprises, Inc]**
 2. **[Romoco Precast Terrazzo Products; a subsidiary of Roman Mosaic & Tile Company]**
 3. **[Wausau Tile, Inc.]**
 4. **<Insert manufacturer's name>**
- C. Precast Terrazzo Base **<Insert designation>**: Minimum **3/4-inch- (19-mm-)** thick, reinforced, portland cement terrazzo units cast in maximum lengths possible, but not less than **36 inches (900 mm)**. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
 1. Type: **[As indicated][Coved with minimum 3/4-inch (19-mm) radius][Straight][Splayed]<Insert requirements>**.

2. Top Edge: **[Straight, unfinished][Beveled with polished top surface][Radius edge with polished top surface]<Insert requirements>**.
3. Metal Toe Strip: **[Zinc][Brass]**.
4. Outside Corner Units: With finished returned edges at outside corner.
5. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors][Match Architect's sample][Match adjacent poured-in-place terrazzo flooring]<Insert requirements>**.

- D. Precast Terrazzo Units **<Insert designation>**: Minimum **[2-inch- (51-mm-)]<Insert dimension>** thick, reinforced, portland cement terrazzo units. Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to **1/8-inch (3.2-mm)** radius.

1. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors][Match Architect's sample][Match adjacent poured-in-place terrazzo flooring]<Insert requirements>**.

2.6 STRIP MATERIALS

- A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Material: **[As indicated][White-zinc alloy][Brass]<Insert requirements>**.
 2. Depth: **[As indicated][3/4 inch (19 mm)][1-1/4 inches (32 mm)][2 inches (51 mm)]<Insert dimension>**.
 3. Width: **[As indicated][0.05 inch (1.27 mm)][1/8 inch (3.2 mm)][1/4 inch (6.4 mm)]<Insert dimension>**.
- B. Heavy-Top Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Base-Section Material: **[As indicated][White-zinc alloy][Galvanized steel]<Insert requirements>**.
 2. Top-Section Material: **[As indicated][White-zinc alloy][Brass][Plastic, in color selected from full range of industry colors]<Insert requirements>**.
 3. Depth: **[As indicated][3/4 inch (19 mm)][1-1/4 inches (32 mm)][2 inches (51 mm)]<Insert dimension>**.
 4. Top-Section Width: **[As indicated][1/8 inch (3.2 mm)][1/4 inch (6.4 mm)][1/2 inch (12.7 mm)]<Insert dimension>**.
- C. Heavy-Top Angle Divider Strips: One-piece, L-type angle strips with anchoring device and in depth required for topping thickness indicated.
1. Material: **[As indicated][White-zinc alloy][Brass][Plastic, in color selected from full range of industry colors]<Insert requirements>**.
 2. Top-Section Width: **[As indicated][1/8 inch (3.2 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert dimension>**.
- D. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- E. Expansion-Joint Strips: **[Brass][Plastic strips in color selected from full range of industry colors]**, with removable zip-strip top for installing sealant.
1. Width: **[As indicated][Minimum 1/2 inch (12.7 mm)]<Insert dimension>**.

- F. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.
 3. Nosings for terrazzo stair treads and landings.
 4. **<Insert requirements>**.
- G. Abrasive Strips: **[Three-line][Two-line][One-line][Abrasive nosing strip and two-line]<Insert requirements>** abrasive inserts at nosings. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.
1. Width: **[1/2 inch (12.7 mm)]<Insert dimension>**.
 2. Depth: As required by terrazzo thickness.
 3. Length: **[4 inches (100 mm) less than stair width][As indicated]<Insert dimension>**.
 4. Color: **[As selected by Architect from full range of industry colors]<Insert requirements>**.

2.7 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Recommended by manufacturer for this use.
1. Adhesives shall have a VOC content of **[70]<Insert value>** g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- B. Anchoring Devices:
1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and as required for secure attachment to substrate.
 2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- D. Isolation and Expansion-Joint Material: Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-outgassing in unruptured state; butyl rubber; rubber; or cork; **[in width indicated][minimum 1/2 inch (12.7 mm) wide]<Insert dimension>**.
- E. Portland Cement Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is

biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.

- F. Rustic Terrazzo Cleaner: Solution of 1 part muriatic acid and 10 parts water.
- G. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's written recommendations for terrazzo type indicated.
 - 1. Surface Friction: Not less than 0.6 according to ASTM D2047.
 - 2. Acid-Base Properties: With pH factor between 7 and 10.
 - 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 5. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 - 6. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 7. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 8. Rustic Terrazzo: Use solvent acrylic-type sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
 - 1. Roughen concrete substrates before installing terrazzo system according to NTMA's written recommendations.
- B. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during

installation.

3.3 INSTALLATION, GENERAL

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Installation Tolerance: Limit variation in terrazzo surface from level to **[1/4 inch in 10 feet (6.4 mm in 3 m)]<Insert dimensions>**; noncumulative.
- C. Rustic Terrazzo: Install isolation and expansion material where abutting adjacent construction and directly above substrate expansion joints.
- D. Underbed:
 - 1. Comply with NTMA's written recommendations for underbed installation.
 - 2. Sand-Cushion Portland Cement Terrazzo:
 - a. Cover entire surface to receive terrazzo with dusting of sand.
 - b. Install isolation membrane over sand, overlapping ends and edges a minimum of **3 inches (75 mm)**.
 - c. Install welded-wire reinforcement, overlapping at edges and ends at least two squares. **[Stop mesh a minimum of 1 inch (25 mm) short of expansion joints.]**
 - 3. Bonded **[Portland Cement][Rustic]** Terrazzo:
 - a. Saturate structural concrete substrate with water, and slush and broom with underbed bonding agent.
 - 4. Place underbed and screed to elevation indicated below finished floor elevation.
- E. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips **[directly over breaks and control joints in concrete slabs][in locations indicated]<Insert requirements>**.
 - b. Install control-joint strips **[back to back and directly above concrete-slab control joints][in locations indicated]<Insert requirements>**.
 - 1) Install control-joint strips with **[1/4-inch (6.4-mm)]<Insert dimension>** gap between strips, and install sealant in gap.
 - c. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Expansion-Joint Strips: Form expansion joints using divider strips and install directly above concrete-slab expansion joints.
 - 3. Accessory Strips: Install as required to provide a complete installation.
 - 4. Abrasive Strips: Install with surface of abrasive strip positioned **[1/16 inch (1.6 mm)]<Insert dimension>** higher than terrazzo surface.

3.4 POURED-IN-PLACE TERRAZZO INSTALLATION

- A. Underbed Preparation:
 - 1. Sand-Cushion Portland Cement Terrazzo: Saturate underbed with water to produce a cement slurry.
 - 2. Bonded **[Portland Cement][Rustic]** Terrazzo: Dampen underbed with water.
- B. Monolithic **[Portland Cement][Rustic]** Terrazzo: Apply topping bonding agent on concrete substrate.
- C. Place terrazzo mixture in panels formed by divider strips and trowel mixture to top of strips. Seed additional aggregates in matrix to uniformly distribute granular material and produce a surface with a minimum of 70 percent aggregate exposure. Roll and compact surface until excess cement and water have been extracted.
 - 1. Portland Cement Terrazzo: Trowel to a dense, uniform, flat surface disclosing lines of divider strips.
- D. Portland Cement Terrazzo Stairs: Install and finish stairs at the same time that adjacent flooring is installed.
- E. Portland Cement Terrazzo Base: Install and finish base at the same time that adjacent flooring is installed.
- F. Portland Cement Terrazzo Finishing: Cover terrazzo topping with moisture-retaining cover and cure until topping develops sufficient strength to prevent lifting or pulling of aggregate during grinding.
 - 1. Rough Grinding: Grind with 24-grit or finer stones or with comparable diamond plates.
 - 2. Grouting: After rough grinding, clean terrazzo topping with water and rinse away residue. Remove excess rinse water, apply matrix mix to grout surface, and fill voids. After grouting, cover surface with moisture-retaining cover to cure grout until ready for fine grinding.
 - 3. Fine Grinding and Polishing: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted. Grind with **[80][120]**-grit stones or with comparable diamond abrasives until grout is removed from surface.
- G. Rustic Terrazzo Finishing: Expose aggregate by hosing or other means recommended in writing by NTMA. Cure the terrazzo topping by flooding with water or covering with moisture-retaining cover.

3.5 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended in writing by NTMA and manufacturer unless otherwise indicated.
- B. Do not install units that are chipped, cracked, discolored, or improperly finished.
- C. Seal joints between units with **[cement grout matching precast terrazzo matrix][joint sealant]<Insert requirements>**.

3.6 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, including areas that emit a "hollow" sound if tapped. Cut out terrazzo areas in panels defined by strips and

replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.7 CLEANING AND PROTECTION

A. Terrazzo Cleaning:

1. Remove grinding dust from installation and adjacent areas.
2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring according to both NTMA's and manufacturer's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.

B. Rustic Terrazzo Cleaning: Clean surfaces with rustic terrazzo cleaner. Legally contain and dispose of runoff from cleaning operations. Rinse surfaces with water and allow them to dry thoroughly.

C. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply sealer according to sealer manufacturer's written instructions.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 66 13 00



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Task	Specification	Specification Description
09 66 13 13	09 66 13 00	Portland Cement Terrazzo Flooring
09 66 13 16	09 66 13 00	Portland Cement Terrazzo Flooring
09 66 13 19	09 66 13 00	Portland Cement Terrazzo Flooring
09 66 16 13	09 66 13 00	Portland Cement Terrazzo Flooring



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SECTION 09 66 23 00 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thin-set, epoxy-resin terrazzo flooring.
2. Precast epoxy-resin terrazzo units.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealants installed with terrazzo.
2. Section 096723 "Resinous Flooring" for decorative resinous flooring systems applied as self-leveling slurries or as troweled or screeded mortars.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.
 - d. **<Insert agenda items>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:

1. Divider strips.
2. Control-joint strips.
3. Accessory strips.

4. Abrasive strips.
5. Stair treads, risers, and landings.
6. Precast terrazzo jointing and edge configurations.
7. Terrazzo patterns.
8. **<Insert requirements>**.

- D. Samples: For each exposed product and for each color and texture specified, **[6 inches (150 mm)]<Insert dimension>** in size.
- E. Samples for Initial Selection: NTMA's "Terrazzo Color Palette" showing the full range of colors and patterns available for each terrazzo type.
- F. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo Sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in sizes indicated below:
 1. Terrazzo: **[6-inch- (150-mm-)]<Insert dimension>** square Samples.
 2. Precast Terrazzo: **[6-inch- (150-mm-)]<Insert dimension>** square Samples.
 3. Accessories: **[6-inch- (150-mm-)]<Insert dimension>** long Samples of each exposed strip item required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- D. Preinstallation moisture-testing reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Engage an installer who is a contractor member of NTMA.
 2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum **100 sq. ft. (9 sq. m)** of typical poured-in-place flooring[**and base**] condition for each color and pattern **[in locations indicated][in locations directed by**

Architect]<Insert location requirements>.

b. Include [base][first three stair treads]<Insert item>.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations, General: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- B. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor

Sources Using Environmental Chambers."

- C. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- E. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 EPOXY-RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo : Comply with manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Crossfield Products Corp]**
 - b. **[Hi-Tek Polymers, Inc]**
 - c. **[Key Resin Company]**
 - d. **[Master Terrazzo Technologies LLC]**
 - e. **[Sherwin-Williams High Performance Flooring]**
 - f. **[Terrazzco Brand; Concord Terrazzo Company, Inc.]**
 - g. **[Terrazzo & Marble Supply Companies]**
 - h. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crossfield Products Corp]**
 - b. **[Hi-Tek Polymers, Inc]**
 - c. **[Key Resin Company]**
 - d. **[Master Terrazzo Technologies LLC]**
 - e. **[Sherwin-Williams High Performance Flooring]**
 - f. **[Terrazzco Brand; Concord Terrazzo Company, Inc.]**
 - g. **[Terrazzo & Marble Supply Companies]**
 - h. **<Insert manufacturer's name>**
- B. Mix Color and Pattern: **[As selected by Architect from manufacturer's full range][As selected by Architect from NTMA's "Terrazzo Color Palette" EI Series][As selected by Architect from NTMA's "Terrazzo Color Palette" EII Series][As selected by Architect from NTMA's "Terrazzo Color**

Palette" EIII Series][As selected by Architect from NTMA's "Terrazzo Color Palette" EIV Series][Match Architect's sample][Match existing]<Insert NTMA designation or custom mix>..

C. Materials:

1. Moisture-Vapor-Emission-Control Membrane: Two-component, high-solids, high-density, low-odor, epoxy-based membrane-forming product produced by epoxy terrazzo manufacturer that reduces moisture emission from concrete substrate to not more than **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours.
2. Substrate-Crack-Suppression Membrane: Product of terrazzo-resin manufacturer, having minimum 120 percent elongation potential according to ASTM D412.
 - a. Reinforcement: Fiberglass scrim.
3. Primer: **[Manufacturer's product recommended for substrate and use indicated]<Insert requirements>**.
4. Epoxy-Resin Matrix: **[Manufacturer's standard recommended for use indicated]<Insert requirements>** and in color required for mix indicated.
 - a. Physical Properties without Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D2240, Shore D.
 - 2) Minimum Tensile Strength: **3000 psi (20.7 MPa)** per ASTM D638 for a **2-inch (51-mm)** specimen made using a "C" die per ASTM D412.
 - 3) Minimum Compressive Strength: **10,000 psi (6.9 MPa)** per ASTM D695, Specimen B cylinder.
 - 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 5 percent acetic acid.
 - h) 10 percent sodium hydroxide.
 - i) 10 percent hydrochloric acid.
 - j) 30 percent sulfuric acid.
 - b. Physical Properties with Aggregates: For terrazzo blended according to manufacturer's recommendations with one part epoxy resin with three parts marble aggregate consisting of 60 percent No. 1 chips and 40 percent No. 0 chips that is ground and grouted to a **1/4-inch (6.35-mm)** nominal thickness, and cured for 7 days at **75 deg F (24 deg C)** plus or minus **2 deg F (1 deg C)** and at 50 percent plus or minus 2 percent relative humidity.
 - 1) Flammability: Self-extinguishing, maximum extent of burning **1/4 inch (6.35 mm)** according to ASTM D635.
 - 2) Thermal Coefficient of Linear Expansion: **0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C)** according to ASTM C531.
5. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131/C131M.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.

- c. Dust Content: Less than 1.0 percent by weight.
- 6. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- 7. Finishing Grout: Resin based.

2.4 PRECAST EPOXY-RESIN TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Precast Terrazzo Enterprises, Inc]**
 - 2. **[Romoco Precast Terrazzo Products; a subsidiary of Roman Mosaic & Tile Company]**
 - 3. **[Wausau Tile, Inc.]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Precast Terrazzo Enterprises, Inc]**
 - 2. **[Romoco Precast Terrazzo Products; a subsidiary of Roman Mosaic & Tile Company]**
 - 3. **[Wausau Tile, Inc.]**
 - 4. **<Insert manufacturer's name>**
- C. Precast Terrazzo Base **<Insert designation>**: Minimum **3/8-inch- (10-mm-)** thick, epoxy terrazzo units cast in maximum lengths possible, but not less than **36 inches (900 mm)**. Comply with manufacturer's written instructions for fabricating precast terrazzo base units in sizes and profiles indicated.
 - 1. Type: **[As indicated][Coved with minimum 3/4-inch (19-mm) radius][Straight][Splayed]<Insert requirements>**.
 - 2. Top Edge: **[Straight, unfinished][Beveled with polished top surface][Radius edge with polished top surface]<Insert requirements>**.
 - 3. Metal Toe Strip: **[Zinc][Brass]**.
 - 4. Outside Corner Units: With finished returned edges at outside corner.
 - 5. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors][Match Architect's sample][Match adjacent poured-in-place terrazzo flooring]<Insert requirements>**.
- D. Precast Terrazzo Units **<Insert designation>**: Minimum **[3/4-inch (19-mm)]<Insert dimension>** thick, epoxy terrazzo units. Comply with manufacturer's written instructions for fabricating precast units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to **1/8-inch (3.2-mm)** radius.
 - 1. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors][Match Architect's sample][Match adjacent poured-in-place terrazzo flooring]<Insert requirements>**.

2.5 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle in depth required for topping thickness indicated.

1. Material: [As indicated][White-zinc alloy][Brass][Aluminum][Plastic, in color selected from full range of industry colors]<Insert requirements>.
 2. Top Width: [As indicated][1/8 inch (3.2 mm)][1/4 inch (6.4 mm)]<Insert dimension>.
- B. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness indicated.
1. Bottom-Section Material: [As indicated][Galvanized steel][Matching top-section material]<Insert requirements>.
 2. Top-Section Material: [As indicated][White-zinc alloy][Brass][Aluminum][Plastic, in color selected from full range of industry colors]<Insert requirements>.
 3. Top-Section Width: [As indicated][1/8 inch (3.2 mm)][1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert dimension>.
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- D. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.
 3. Nosings for terrazzo stair treads and landings.
 4. <Insert requirements>.
- E. Abrasive Strips: [Three-line][Two-line][One-line][Abrasive nosing strip and two-line]<Insert requirements> abrasive inserts at nosings. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.
1. Width: [1/2 inch (12.7 mm)]<Insert dimension>.
 2. Depth: As required by terrazzo thickness.
 3. Length: [4 inches (100 mm) less than stair width][As indicated]<Insert dimension>.
 4. Color: [As selected by Architect from full range of industry colors]<Insert requirements>.

2.6 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m

and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- B. Anchoring Devices:
 - 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and as required for secure attachment to substrate.
 - 2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: **[Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; and is recommended by sealer manufacturer][Acrylic][Urethane][Chemical-resistant epoxy][Water based]<Insert requirements>.**
 - 1. Surface Friction: Not less than 0.6 according to ASTM D2047.
 - 2. Acid-Base Properties: With pH factor between 7 and 10.
 - 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 5. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 - 6. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 7. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written instructions.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
- D. Preinstallation Moisture Testing:
 - 1. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests.
 - 2. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)]<Insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Moisture-Vapor-Emission Test: Maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]<Insert rate>** in 24 hours when tested according to ASTM F1869 using anhydrous calcium chloride.
 - b. Relative Humidity Test: Maximum **[75]<Insert number>** percent relative humidity measurement when tested according to ASTM F2170 using in-situ probes.
 - 3. Proceed with terrazzo installation only after concrete substrates pass moisture testing**[or after installation of moisture-vapor-emission-control membrane on substrate areas that fail testing]**.
- E. Moisture-Vapor-Emission-Control Membrane: Install according to manufacturer's written instructions.
 - 1. Install on concrete substrates that incorporate lightweight aggregates.
 - 2. Install concrete substrates that fail preinstallation moisture testing.
- F. Substrate-Crack-Suppression Membrane: Install to isolate and suppress substrate cracks according to manufacturer's written instructions.
 - 1. Prepare and prefill substrate cracks with membrane material.
 - 2. Install membrane **[at substrate cracks][to produce full substrate coverage]** in areas to receive terrazzo.
 - 3. Reinforce membrane with fiberglass scrim.
- G. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips **[in locations indicated]<Insert requirements>**.
 - b. Install control-joint strips **[back to back and directly above concrete-slab control joints][in locations indicated]<Insert requirements>**.
 - c. Install control-joint strips with **[1/4-inch (6.4-mm)]<Insert dimension>** gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install **[as required to provide a complete installation][in locations indicated]<Insert requirements>**.
 - 3. Abrasive Strips: Install with surface of abrasive strip positioned **[1/16 inch (1.6 mm)]<Insert dimension>** higher than terrazzo surface.
- C. Apply primer to terrazzo substrates according to manufacturer's written instructions.
- D. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions.
 - 1. Installed Thickness: **[1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][As indicated on Drawings]<Insert dimension>** nominal.
 - 2. Terrazzo Finishing: Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
 - a. Rough Grinding: Grind with 24-grit or finer stones or with comparable diamond abrasives. Follow initial grind with 60/80-grit stones or with comparable diamond abrasives.
 - b. Grouting: Before grouting, clean terrazzo with water, rinse, and allow to dry. Apply and cure epoxy grout.
 - c. Fine Grinding/Polishing: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted. Grind with **[80][120]**-grit stones or with comparable diamond abrasives until grout is removed from surface.
 - 3. Installation Tolerance: Limit variation in terrazzo surface from level to **[1/4 inch in 10 feet (6.4 mm in 3 m)]<Insert dimensions>**; noncumulative.
- E. Install and finish poured-in-place terrazzo stairs at the same time the adjacent terrazzo flooring is installed.
- F. Install and finish poured-in-place terrazzo base at the same time the adjacent terrazzo flooring is installed.

3.4 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended in writing by NTMA and manufacturer unless otherwise indicated.

- B. Do not install units that are chipped, cracked, discolored, or improperly finished.
- C. Seal joints between units with **[[joint compound matching precast terrazzo matrix]][joint sealant]<Insert requirements>**.

3.5 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.6 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 66 23 00



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Task	Specification	Specification Description
09 66 23 16	09 66 23 00	Resinous Matrix Terrazzo Flooring
09 66 33 13	09 66 23 00	Resinous Matrix Terrazzo Flooring
09 66 33 16	09 66 23 00	Resinous Matrix Terrazzo Flooring
09 66 33 19	09 66 23 00	Resinous Matrix Terrazzo Flooring
09 67 00 00	09 67 23 00	Resinous Flooring
09 67 00 00	09 65 66 00a	Fluid-Applied Athletic Flooring
09 67 16 00	09 67 23 00	Resinous Flooring
09 67 16 00	09 65 66 00a	Fluid-Applied Athletic Flooring



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SECTION 09 67 23 00 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resinous flooring.
2. Integral cove base accessories.

B. Related Sections:

1. Section 071800 "Traffic Coatings" for vehicular-traffic-bearing, elastomeric flooring systems.
2. Section 096623 "Resinous Matrix Terrazzo Flooring" for thinset, epoxy-matrix terrazzo.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review manufacturer's written instructions for substrate preparation and environmental conditions affecting resinous flooring installation.
2. Review details of integral cove bases.
3. Review manufacturer's written instructions for installing resinous flooring systems.
4. Review protection measures for adjacent construction and installed flooring, floor drainage requirements, curbs, base details, and so forth.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Environmental Product Declaration: For each product.
5. Environmental Product Declaration: For each product.
6. Environmental Product Declaration: For each product.
7. Third-Party Certifications: For each product.
8. Third-Party Certified Life Cycle Assessment: For each product.
9. Multi-Attribute Optimization: For each product, provide documentation of third-party certification, indicating impact reduction in global warming potential, depletion of stratospheric ozone layer, acidification of land and water sources, eutrophication, and/or formation of tropospheric ozone.
10. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
11. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

12. Supply Chain Optimization: For each product, provide documentation demonstrating that manufacturer practices comply with supply chain optimization requirements.
13. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
14. Laboratory Test Reports: For finish system, indicating compliance with requirements for low-emitting materials.
15. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
16. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
17. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
18. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
19. Product Data: For adhesives, indicating that product contains no urea formaldehyde.

- C. Samples: For each resinous floor system required and for each color and texture specified, **6 inches (150 mm)** square in size, applied to a rigid backing by Installer for this Project.
- D. Samples for Initial Selection: For each type of exposed finish required.
- E. Samples for Verification: For each resinous flooring system required and for each color and texture specified, **6 inches (150 mm)** square, applied to a rigid backing by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each resinous flooring component.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Apply full-thickness mockups on **96-inch- (2400-mm-)** square floor area [**indicated on Drawings**][**selected by Architect**].
 - a. Include **96-inch (2400-mm)** length of integral cove base with inside[**and outside**] corner.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.
- C. Close spaces to traffic during resinous flooring installation and for 24 hours after installation unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Flammability: Self-extinguishing in accordance with ASTM D635.

2.2 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor[**and integral cove base**].

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [SIMIRON Inc.]
 - b. [American Safety Technologies; a Holcim brand]
 - c. [Arizona Polymer Flooring, Inc.]
 - d. [Cornerstone Flooring]
 - e. [Crossfield Products Corp]
 - f. [Crown Polymers Corp.]
 - g. [Delta Polymers, Inc.]
 - h. [Dudick Inc.]
 - i. [Dur-A-Flex; a Sherwin Williams Company]
 - j. [Elite Crete Systems]
 - k. [Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]
 - l. [Everlast Epoxy Systems, Inc.]
 - m. [FLEXMAR Coatings, Inc.]
 - n. [Florock; Crawford Laboratories Inc.]
 - o. [Garland Company, Inc. (The)]
 - p. [Key Resin Company]
 - q. [KOSTER American Corporation]
 - r. [Laticrete International, Inc.]
 - s. [Master Builders Solutions]
 - t. [Milamar Coatings, LLC]
 - u. [Neogard; Hempel Group]
 - v. [Northern Industries, Inc.]
 - w. [Nox-Crete Products Group]
 - x. [Polymerica, Incorporated]
 - y. [Rock-Tred Corporation]
 - z. [Sauereisen]
 - aa. [Sherwin-Williams High Performance Flooring]
 - bb. [Sika Corporation; Flooring]
 - cc. [Stonhard, Inc.]
 - dd. [Tennant Coatings]
 - ee. [Terrazzo & Marble Supply Companies]
 - ff. [Tnemec Company, Inc.]
 - gg. [Tufco International Inc.]
 - hh. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [SIMIRON Inc.]
 - b. [American Safety Technologies; a Holcim brand]
 - c. [Arizona Polymer Flooring, Inc.]
 - d. [Cornerstone Flooring]
 - e. [Crossfield Products Corp]
 - f. [Crown Polymers Corp.]

- g. [Delta Polymers, Inc.]
- h. [Dudick Inc.]
- i. [Dur-A-Flex; a Sherwin Williams Company]
- j. [Elite Crete Systems]
- k. [Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]
- l. [Everlast Epoxy Systems, Inc.]
- m. [FLEXMAR Coatings, Inc.]
- n. [Florock; Crawford Laboratories Inc.]
- o. [Garland Company, Inc. (The)]
- p. [Key Resin Company]
- q. [KOSTER American Corporation]
- r. [Laticrete International, Inc.]
- s. [Master Builders Solutions]
- t. [Milamar Coatings, LLC]
- u. [Neogard; Hempel Group]
- v. [Northern Industries, Inc.]
- w. [Nox-Crete Products Group]
- x. [Polymerica, Incorporated]
- y. [Rock-Tred Corporation]
- z. [Sauereisen]
- aa. [Sherwin-Williams High Performance Flooring]
- bb. [Sika Corporation; Flooring]
- cc. [Stonhard, Inc.]
- dd. [Tennant Coatings]
- ee. [Terrazzo & Marble Supply Companies]
- ff. [Tnemec Company, Inc.]
- gg. [Tufco International Inc.]
- hh. <Insert manufacturer's name>

- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- C. System Characteristics:
- 1. Color and Pattern: **[As selected by Architect from manufacturer's full range][As indicated by manufacturer's product designation][Match Architect's sample]<Insert description>.**
 - 2. Wearing Surface: **[Textured for slip resistance][Orange-peel texture][Smooth][Manufacturer's standard wearing surface]<Insert description>.**
 - 3. Overall System Thickness: **[20 mils (0.5 mm)][40 mils (1.0 mm)][1/16 inch (1.6 mm)][1/8 inch (3.2 mm)][3/16 inch (4.8 mm)][1/4 inch (6.4 mm)]<Insert thickness>.**
- D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:
- 1. Compressive Strength: **<Insert value>** minimum in accordance with ASTM C579.
 - 2. Tensile Strength: **<Insert value>** minimum in accordance with ASTM C307.
 - 3. Flexural Modulus of Elasticity: **<Insert value>** minimum in accordance with ASTM C580.
 - 4. Water Absorption: **<Insert number>** percent maximum in accordance with ASTM C413.
 - 5. Shrinkage: **<Insert number>** percent maximum in accordance with ASTM C531.
 - 6. Indentation: **<Insert number>** percent maximum in accordance with MIL-D-3134J.
 - 7. Impact Resistance: No chipping, cracking, or delamination and not more than **1/16-inch (1.6-mm)** permanent indentation in accordance with MIL-D-3134J.
 - 8. Resistance to Elevated Temperature: No slip or flow of more than **1/16 inch (1.6 mm)** in accordance with MIL-D-3134J.

9. Abrasion Resistance: **<Insert value>** maximum weight loss in accordance with ASTM D4060.
 10. Hardness: **<Insert value>**, Shore D in accordance with ASTM D2240.
 11. Critical Radiant Flux: **[0.45 W/sq. cm][0.22 W/sq. cm]** or greater in accordance with NFPA 253.
- E. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested in accordance with **[ASTM D1308 for 50 percent immersion][ASTM D543, Procedure A, for immersion][ASTM C267 for immersion]<Insert testing requirements>** in the following reagents for no fewer than seven days:
1. **<Insert list of reagents that Owner has determined are likely to contact resinous flooring during in-service use>**.
- F. Primer: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.
1. Products:
 - a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation>**.
 2. Formulation Description: **[100 percent solids][High solids][Water based]<Insert requirements>**.
- G. Waterproofing Membrane: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.
1. Products:
 - a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation>**.
 2. Formulation Description: **[100 percent solids][High solids]<Insert requirements>**.
- H. Reinforcing Membrane: Flexible resin formulation that is recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
1. Products:
 - a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation>**.
 2. Formulation Description: **[100 percent solids][High solids]<Insert requirements>**.
 - a. Provide fiberglass scrim embedded in reinforcing membrane.
- I. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended in writing by manufacturer for installation indicated.
1. Products:
 - a. **<Insert, in separate subparagraphs, manufacturer's name; product name or designation>**.

J. Body Coats:

1. Products:
 - a. <Insert, in separate subparagraphs, manufacturer's name; product name or designation>.
2. Resin: [Epoxy][Urethane][Epoxy novolac][Vinyl ester][Methyl methacrylate][Polyaspartic]<Insert resin>.
3. Formulation Description: [100 percent solids][High solids][Water based]<Insert requirements>.
4. Type: [Clear][Pigmented]<Insert description>.
5. Installation Method: [Self-leveling slurry with broadcast aggregates][Self-leveling slurry][Troweled or screeded].
6. Number of Coats: [One][Two]<Insert number>.
7. Thickness of Coats: [8 mils (0.2 mm)][1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert thickness>.
8. Aggregates: [Manufacturer's standard][Colored quartz (ceramic-coated silica)][Vinyl flakes][Granite][Natural silica]<Insert requirements>.

K. Grout Coat:

1. Products:
 - a. <Insert, in separate subparagraphs, manufacturer's name; product name or designation>.
2. Resin: [Epoxy][Urethane][Epoxy novolac][Vinyl ester][Methyl methacrylate][Polyaspartic]<Insert resin>.
3. Formulation Description: [100 percent solids][High solids][Water based]<Insert requirements>.
4. Type: [Clear][Pigmented]<Insert description>.
5. Thickness of Coat: [8 mils (0.2 mm)][1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert thickness>.

L. Topcoats: Sealing or finish coats.

1. Products:
 - a. <Insert, in separate subparagraphs, manufacturer's name; product name or designation>.
2. Resin: [Epoxy][Urethane][Epoxy novolac][Vinyl ester][Methyl methacrylate][Polyaspartic]<Insert resin>.
3. Formulation Description: [100 percent solids][High solids][Water based]<Insert requirements>.
4. Type: [Clear][Pigmented]<Insert description>.
5. Number of Coats: [One][Two]<Insert number>.
6. Thickness of Coats: [8 mils (0.2 mm)][1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert thickness>.
7. Finish: [Matte][Gloss].

2.3 INTEGRAL COVE BASE ACCESSORIES

- A. Precast, Integral Cove Base: Impact-resistant, polymer-resin, cove base moldings with a grit profile to

promote adhesion of resinous flooring and recommended in writing by resinous flooring manufacturer.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[SpeedCove, Inc.]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[SpeedCove, Inc.]**
 - b. **<Insert manufacturer's name>**
 3. Radius Cove: Cove molding with approximately **1-inch (25-mm)** radius for adhesive installation at floor-to-wall joint as substrate to receive resinous flooring system to form an integral cove base.
 4. Radius Cove Base: **[4-inch- (102-mm-)][6-inch- (152-mm-)][8-inch- (203-mm-)]** high base molding that provides approximately **1-inch (25-mm)** radius cove at floor-to-wall joint; for adhesive installation as substrate for resinous flooring system to form an integral cove base.
 - a. Preformed Inside and Outside Corners: Provide manufacturer's standard square inside and **[square][3/4- to 1-inch (19- to 25-mm) bullnose]** outside corners.
- B. Installation Adhesive: As recommended in writing by accessory manufacturer.
1. Adhesives: Do not use adhesives that contain urea formaldehyde.
 2. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesives: Do not use adhesives that contain urea formaldehyde.
 5. Adhesives: Do not use adhesives that contain urea formaldehyde.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resinous flooring systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.
 - 3. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)][1000 sq. ft. (304.8 sq. m)]<Insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)][5 lb of water/1000 sq. ft. (2.27 kg of water/92.9 sq. m)]<Insert value>** in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **[75]<Insert number>** percent relative humidity level measurement.
 - 4. Alkalinity and Adhesion Testing: Perform tests recommended in writing by resinous flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than **[6]<Insert number>** or more than **[8]<Insert number>** pH unless otherwise recommended in writing by flooring manufacturer,
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

3.3 INSTALLATION

- A. Apply components of resinous flooring system in accordance with manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.
 - 1. Coordinate installation of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components in accordance with manufacturer's written instructions. Prevent contamination during installation and curing processes.

3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
 - B. Primer: Apply primer over prepared substrate at spreading rate recommended in writing by manufacturer.
 - C. Waterproofing Membrane: Apply waterproofing membrane **[where indicated on Drawings][over entire substrate surface]<Insert location>**, in thickness recommended in writing by manufacturer.
 1. Apply waterproofing membrane to integral cove base substrates.
 - D. Reinforcing Membrane: Apply reinforcing membrane to **[substrate cracks][entire substrate surface]<Insert requirements>**.
 - E. Integral Cove Base Accessories: Adhesively install precast accessories before applying flooring coats and in accordance with manufacturer's written instructions.
 - F. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 1. Integral Cove Base: **[4 inches (100 mm)]<Insert dimension>** high.
 - G. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness specified for flooring system.
 1. Aggregates: Broadcast aggregates at rate recommended in writing by manufacturer. After resin is cured, remove excess aggregates to provide surface texture indicated.
 - H. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness specified for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended in writing by manufacturer.
 - I. Grout Coat: Apply grout coat to fill voids in surface of final body coat.
 - J. Topcoats: Apply topcoats in number indicated for flooring system specified, at spreading rates recommended in writing by manufacturer, and to produce wearing surface specified.
- 3.4 FIELD QUALITY CONTROL
- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring installation, require material samples for testing for compliance with requirements.
 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reinstall flooring materials to comply with requirements.
 - B. Core Sampling: At Owner's direction and at locations designated by Owner, take one core sample per

1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

3.5 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23 00



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Task	Specification	Specification Description
09 67 23 00	09 65 66 00a	Fluid-Applied Athletic Flooring



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SECTION 09 68 13 00 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tiles.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. **[Section 096513 "Resilient Base and Accessories"]****[Section 096519 "Resilient Tile Flooring"]** for resilient wall base and accessories installed with carpet tile.
3. Section 096816 "Sheet Carpeting" for carpet roll goods.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference **[at Project site]****[by web conference]****<Insert location>** .

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of carpet tile.
 - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- D. Samples for Verification: Actual Sample of finished products for each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: **12-inch- (300-mm-) long** Samples.
- E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- F. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Health Product Declaration (HPD): Provide product's Material Health Certificate or Cradle to Cradle certification.
 - 3. Declare, Action Submittals: Provide product's Declare product label, designated as "Red List Free," Declare, or Living Building Challenge (LBC) compliant to 0.1 percent.
 - 4. Environmental Product Declaration (EPD): For each product.
 - 5. Health Product Declaration (HPD): For each product.
 - 6. Environmental Product Declaration (EPD): For each product.
 - 7. Health Product Declaration (HPD): For each product.
 - 8. Environmental Product Declaration (EPD): For each product.
 - 9. Environmental Product Declaration (EPD): For each product.
 - 10. Environmental Product Declaration (EPD): For each product.
 - 11. Third-Party Certifications: For each product.
 - 12. Third-Party-Certified Life-Cycle Assessment: For each product.
 - 13. Facts, Action Submittals: Provide product's Facts - NSF/ANSI 336, "Sustainability Assessment for Commercial Furnishings Fabric," certification.
 - 14. Health Product Declaration (HPD): For each product.
 - 15. Health Product Declaration (HPD): Provide HPD.
 - 16. Life-Cycle Impact-Reduction Action Plan, Action Submittals: Provide product-specific, Life-Cycle Assessment (LCA) complying with EN 15804 or ISO 21930.
 - 17. Supply Chain Optimization: For each product, provide documentation demonstrating that manufacturer practices comply with supply chain optimization requirements.
 - 18. Supply Chain Optimization: For each product, provide documentation demonstrating that manufacturer practices comply with supply chain optimization requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- B. Qualification Statements: For Installer.
- C. Sample Warranties: For carpet tile.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to **[5]<Insert number>** percent of amount installed for each type indicated, but no fewer than 10 full-size units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is certified by the International Certified Floorcovering Installers Association at the **[Commercial II][Master II]<Insert description>** certification level.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockups **[as indicated on Drawings]<Insert mockup requirements>** .
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
 - b. Loss of tuft-bind strength.
 - c. Excess static discharge.
 - d. Delamination.
 - e. Dimensional instability.
 3. Warranty Period: **[10][15]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILES

- A. Carpet Tile :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Bentley Mills, Inc.]**
 - b. **[Engineered Floors]**
 - c. **[Interface, Inc.]**
 - d. **[J&J Flooring Group LLC]**
 - e. **[Mannington Commercial; a business unit of Mannington Mills, Inc.]**
 - f. **[Mohawk Group]**
 - g. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - h. **[StaticSmart; Julie Industries]**
 - i. **[Tarkett USA]**
 - j. **[van Gelder, Inc]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Bentley Mills, Inc.]**
 - b. **[Engineered Floors]**
 - c. **[Interface, Inc.]**
 - d. **[J&J Flooring Group LLC]**
 - e. **[Mannington Commercial; a business unit of Mannington Mills, Inc.]**
 - f. **[Mohawk Group]**
 - g. **[Shaw Industries Group, Inc.; Berkshire Hathaway Company]**
 - h. **[StaticSmart; Julie Industries]**
 - i. **[Tarkett USA]**

- j. [van Gelder, Inc]
- k. <Insert manufacturer's name>

- 3. Color: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color> .
- 4. Pattern: [Match Architect's samples]<Insert pattern> .
- 5. Fiber Content: [100 percent nylon 6,6][100 percent nylon 6][100 percent polypropylene][100 percent wool][80 percent wool; 20 percent nylon 6,6][80 percent wool; 20 percent nylon 6]<Insert percentage> .
- 6. Fiber Type: <Insert proprietary fiber type> .
- 7. Pile Characteristic: [Level-loop][Cut][Cut-and-loop]<Insert construction> pile.
- 8. Yarn Twist: <Insert TPI (TPCM)> .
- 9. Yarn Count: <Insert count> .
- 10. Density: <Insert oz./cu. yd. (g/cu. cm)> .
- 11. Pile Thickness: <Insert inches (mm)> for finished carpet tile [in accordance with ASTM D6859] .
- 12. Stitches: <Insert stitches per inch (mm)> .
- 13. Gauge: <Insert ends per inch (mm)> .
- 14. Surface Pile Weight: <Insert oz./sq. yd. (g/sq. m)> .
- 15. Total Weight: <Insert oz./sq. yd. (g/sq. m)> for finished carpet tile.
- 16. Primary Backing/Backcoating: [Manufacturer's standard composite materials]<Insert specific primary backing materials; consult manufacturers> .
- 17. Secondary Backing: [Manufacturer's standard material]<Insert specific secondary backing material> .
- 18. Backing System: <Insert proprietary name> .
- 19. Size: [18 by 18 inches (457 by 457 mm)][24 by 24 inches (610 by 610 mm)][18 by 36 inches (457 by 914 mm)][36 by 36 inches (914 by 914 mm)]<Insert dimensions> .
- 20. Applied Treatments:
 - a. Soil-Resistance Treatment: [Manufacturer's standard treatment]<Insert treatment> .
 - b. Antimicrobial Treatment: [Manufacturer's standard treatment]<Insert treatment> that protects carpet tiles as follows:
 - 1) Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- 21. Sustainable Design Requirements:
 - a. Sustainable Product Certification: [Silver][Gold][Platinum] level certification in accordance with NSF/ANSI 140.
 - b. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - c. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 - d. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - e. Extended Producer Responsibility: Provide documentation of manufacturer participation in an extended producer responsibility program.
 - f. Life-Cycle Analysis: Provide documentation indicating product contribution to reduction in global warming potential, depletion of the stratospheric ozone layer, acidification of land and water sources, eutrophication, formation of tropospheric ozone, and depletion of

- g. nonrenewable energy resources.
- g. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

22. Performance Characteristics:

- a. Texture Appearance Retention Rating (TARR): **[Moderate traffic, 2.5][Heavy traffic, 3.0][Severe traffic, 3.5]<Insert number>** minimum in accordance with ASTM D7330.
- b. Critical Radiant Flux Classification: Not less than **[0.45 W/sq. cm][0.22 W/sq. cm]** in accordance with NFPA 253.
- c. Dry Breaking Strength: Not less than **100 lbf (445 N)** in accordance with ASTM D2646.
- d. Tuft Bind: Not less than **[3 lbf (13 N)][5 lbf (22 N)][6.2 lbf (28 N)][8 lbf (36 N)][10 lbf (45 N)]<Insert value>** in accordance with ASTM D1335.
- e. Delamination: Not less than **[3.5 lbf/in. (0.6 N/mm)][4 lbf/in. (0.7 N/mm)]<Insert value>** in accordance with ASTM D3936.
- f. Dimensional Tolerance: Within **1/32 inch (0.8 mm)** of specified size dimensions, as determined by physical measurement.
- g. Noise Reduction Coefficient (NRC): **<Insert NRC>** in accordance with ASTM C423.
- h. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
- i. Colorfastness to Light: Not less than 4 after **[40][60]<Insert number>** AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.
- j. Electrostatic Propensity: Less than **[3.5][2]<Insert number>** kV in accordance with AATCC 134.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with **[mill]<Insert finish>** finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft. (20 sq. m)][1000 sq. ft. (100 sq. m)]<Insert area>**, and perform no fewer than three tests in

each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m)]<Insert emission> in 24 hours.
- b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer. Verify the following:

1. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than [1/8 inch (3 mm)]<Insert dimension> , protrusions more than 1/32 inch (0.8 mm), and substances that may interfere with adhesive bond or show through surface.

G. Access Flooring Systems: Verify the following:

1. Access floor substrate is compatible with carpet tile and adhesive if any.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.
- B. Trowelable Levelling and Patching Compounds: Use trowelable leveling and patching compounds in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION OF CARPET TILES

- A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: **[As recommended in writing by carpet tile manufacturer][Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive][Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive][Free lay; install carpet tiles without adhesive]** .
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns **[indicated on Drawings][recommended in writing by carpet tile manufacturer]** .
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.
- I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING

- A. Perform cleaning operations immediately after installing carpet tile as follows:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended in writing by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.

3.5 PROTECTION

- A. Protect installed carpet tile to comply with CRI 104, Section 13.7.
- B. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13 00

SECTION 09 68 16 00 - SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tufted carpet.
2. Woven carpet.
3. Carpet cushion.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. **[Section 096513 "Resilient Base and Accessories"]****[Section 096519 "Resilient Tile Flooring"]** for resilient wall base and accessories installed with carpet.
3. Section 096813 "Tile Carpeting" for modular carpet tiles.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]**<Insert location>.

1. Review methods and procedures related to carpet installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. <Insert agenda items>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Locations where dye lot changes occur.
4. Seam locations, types, and methods.
5. Type of subfloor.
6. Type of installation.
7. Pattern type, repeat size, location, direction, and starting point.
8. Pile direction.
9. Type, color, and location of insets and borders.

10. Type, color, and location of edge, transition, and other accessory strips.
 11. Transition details to other flooring materials.
 12. Type of carpet cushion.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of product.
1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- D. Samples for Verification: Actual sample of finished products for each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: **12-inch- (300-mm-)** square Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: **12-inch- (300-mm-)** long Samples.
 3. Carpet Cushion: **6-inch- (150-mm-)** square Sample.
 4. Carpet Seam: **6-inch (150-mm)** Sample.
 5. Mitered Carpet-Border Seam: **12-inch- (300-mm-)** square Sample. Show carpet pattern alignment.
- E. Product Schedule: For carpet[**and carpet cushion**]. Use same designations indicated on Drawings.
- F. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.
 2. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 4. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Health Product Declaration (HPD): Provide product's Material Health Certificate or Cradle to Cradle certification.
 6. Declare, Action Submittals: Provide product's Declare product label, designated as "Red List Free," Declare or Living Building Challenge (LBC) compliant to 0.1 percent.
 7. Environmental Product Declaration: For each product.
 8. Health Product Declaration: For each product.
 9. Environmental Product Declaration: For each product.
 10. Environmental Product Declaration: For each product.
 11. Environmental Product Declaration: For each product.
 12. Third-Party Certifications: For each product.
 13. Third-Party Certified Life Cycle Assessment: For each product.
 14. Facts, Action Submittals: Provide product's Facts - NSF/ANSI 336, "Sustainability Assessment for Commercial Furnishings Fabric," certification.
 15. Health Product Declaration (HPD): For each product.
 16. Health Product Declaration (HPD): Provide HPD.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For carpet[**and carpet cushion**], for tests performed by a qualified testing agency.
- B. Qualification Statements: For Installer.
- C. Sample Warranties: For sheet carpeting.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet[**and carpet cushion**].

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet: Full-width rolls equal to [5]<Insert number> percent of amount installed for each type indicated, but not less than **10 sq. yd. (8.3 sq. m)**.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is certified by the International Certified Floorcovering Installers Association at the [**Commercial II**][**Master II**]<Insert description> certification level.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups [**as indicated on Drawings**]<Insert mockup requirements>.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.
- B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet[**and carpet cushion**] until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet[**and carpet cushion**] over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended in writing by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
 - b. Loss of tuft-bind strength.
 - c. Excess static discharge.
 - d. Delamination.
 - 3. Warranty Period: **[10][15]<Insert number>** years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty includes removal and replacement of carpet and accessories required by replacement of carpet cushion.
 - 2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 3. Failure includes, but is not limited to, permanent indentation or compression.
 - 4. Warranty Period: **[10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 TUFTED CARPET**

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[Beaulieu International Group]**
 - 2. **[Bentley Mills, Inc.]**

3. [Couristan, Inc.]
 4. [Interface, Inc.]
 5. [J&J Flooring Group LLC]
 6. [Mannington Commercial; a business unit of Mannington Mills, Inc.]
 7. [Mohawk Carpet, LLC; The Mohawk Group]
 8. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 9. [Tarkett USA]
 10. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Beaulieu International Group]
 2. [Bentley Mills, Inc.]
 3. [Couristan, Inc.]
 4. [Interface, Inc.]
 5. [J&J Flooring Group LLC]
 6. [Mannington Commercial; a business unit of Mannington Mills, Inc.]
 7. [Mohawk Carpet, LLC; The Mohawk Group]
 8. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 9. [Tarkett USA]
 10. <Insert manufacturer's name>
- C. Color: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>.
- D. Pattern: [Match Architect's samples]<Insert pattern>.
- E. Fiber Content: [100 percent nylon 6,6][100 percent nylon 6][100 percent polypropylene]<Insert fiber and content by percentage>.
- F. Fiber Type: <Insert proprietary fiber type>.
- G. Pile Characteristic: [Level-loop][Cut][Cut-and-loop][Multilevel-loop][Level tip shear][Random shear][Frieze][Sculptured]<Insert characteristic> pile.
- H. Yarn Twist: <Insert twist in TPI (TPCM)>.
- I. Yarn Count: <Insert yarn count>.
- J. Density: <Insert oz./cu. yd. (g/cu. cm)>.
- K. Pile Thickness: <Insert inches (mm)> for finished carpet[in accordance with ASTM D6859].
- L. Stitches: <Insert stitches per inch (mm)>.
- M. Gage: <Insert gage in ends per inch (mm)>.
- N. Face Weight: <Insert oz./sq. yd. (g/sq. m)>.
- O. Total Weight: <Insert oz./sq. yd. (g/sq. m)> for finished carpet.
- P. Primary Backing: [Manufacturer's standard material][Woven polypropylene][Nonwoven, polypropylene or polyester]<Insert specific primary backing material>.

- Q. Secondary Backing: **[Manufacturer's standard material][Woven polypropylene][Nonwoven, polypropylene or polyester][Woven jute][Fiberglass]<Insert specific secondary backing material>**.
- R. Backcoating: **[Manufacturer's standard material][SBR latex]<Insert backcoating; consult manufacturers>**.
- S. Backing System: **<Insert proprietary name>**.
- T. Roll Width: **[12 ft. (3.7 m)][6 ft. (1.8 m)][13.5 ft. (4.1 m)][15 ft. (4.6 m)]<Insert dimension>**.
- U. Applied Treatments:
1. Applied Soil-Resistance Treatment: **[Manufacturer's standard material]<Insert treatment>**.
 2. Antimicrobial Treatment: **[Manufacturer's standard material]<Insert treatment>**.
 - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- V. Sustainable Design Requirements:
1. Sustainable Product Certification: **[Silver][Gold][Platinum]** level certification in accordance with NSF/ANSI 140.
 2. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 4. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Verify Adhesives have a VOC content of **[50]<Insert number>** g/L or less.
 6. Extended Producer Responsibility: Provide documentation of manufacturer participation in an extended producer responsibility program.
 7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- W. Performance Characteristics:
1. Texture Appearance Retention Rating (TARR): **[Moderate traffic, 2.5][Heavy traffic, 3.0][Severe traffic, 3.5]<Insert number>** minimum in accordance with ASTM D7330.
 2. Critical Radiant Flux Classification: Not less than **[0.45 W/sq. cm][0.22 W/sq. cm]** in accordance with NFPA 253.
 3. Dry Breaking Strength: Not less than **100 lbf (445 N)** in accordance with ASTM D2646.
 4. Tuft Bind: Not less than **[3 lbf (13 N)][5 lbf (22 N)][6.2 lbf (28 N)][8 lbf (36 N)][10 lbf (45 N)]<Insert value>** in accordance with ASTM D1335.
 5. Delamination: Not less than **[2.5 lbf/in. (0.4 N/mm)][3.5 lbf/in. (0.6 N/mm)][4 lbf/in. (0.7 N/mm)]<Insert value>** in accordance with ASTM D3936.
 6. Noise Reduction Coefficient (NRC): **<Insert NRC>** in accordance with ASTM C423.
 7. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
 8. Colorfastness to Light: Not less than 4 after **[40][60]<Insert number>** AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.

9. Electrostatic Propensity: Less than [3.5][2]<Insert number> kV in accordance with AATCC 134.

2.2 WOVEN CARPET

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Axminster Carpets]
 2. [Bentley Mills, Inc.]
 3. [Bloomsburg Carpet Industries, Inc.]
 4. [Couristan, Inc.]
 5. [Langhorne Carpet Company]
 6. [Mohawk Carpet, LLC; The Mohawk Group]
 7. [Prestige Mills, Inc.]
 8. [Stanton Carpet Corporation]
 9. [Tarkett USA]
 10. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Axminster Carpets]
 2. [Bentley Mills, Inc.]
 3. [Bloomsburg Carpet Industries, Inc.]
 4. [Couristan, Inc.]
 5. [Langhorne Carpet Company]
 6. [Mohawk Carpet, LLC; The Mohawk Group]
 7. [Prestige Mills, Inc.]
 8. [Stanton Carpet Corporation]
 9. [Tarkett USA]
 10. <Insert manufacturer's name>
- C. Color: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>.
- D. Pattern: [Match Architect's samples]<Insert pattern>.
- E. Fiber Content: [100 percent wool][80 percent wool; 20 percent nylon 6,6][80 percent wool; 20 percent nylon 6]<Insert fiber and content by percentage>.
- F. Face Construction: [Axminster][Wilton][Velvet]<Insert construction>.
- G. Pile Characteristic: [Level-loop][Cut][Cut-and-loop] pile.
- H. Yarn Twist: <Insert twist in TPI (TPCM)>.
- I. Yarn Count: <Insert yarn count>.
- J. Density: <Insert oz./cu. yd. (g/cu. cm)>.
- K. Pile Thickness: <Insert inches (mm)> for finished carpet[in accordance with ASTM D6859].
- L. Rows: <Insert number of lengthwise tufts per inch (mm)>.

- M. Pitch: <Insert number of rows in 27 inches (686 mm)>.
- N. Face Weight: <Insert oz./sq. yd. (g/sq. m)>.
- O. Total Weight: <Insert oz./sq. yd. (g/sq. m)> for finished carpet.
- P. Backing: **[Manufacturer's standard.]****[As follows:]**
1. Chain Warp: <Insert material>.
 2. Stuffer Warp: <Insert material>.
 3. Shot or Fill Weft: <Insert material>.
 4. Backcoating: <Insert backcoating>.
- Q. Applied Treatments:
1. Applied Soil-Resistance Treatment: **[Manufacturer's standard material]**<Insert treatment>.
 2. Antimicrobial Treatment: **[Manufacturer's standard material]**<Insert treatment>.
 - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- R. Sustainable Design Requirements:
1. Sustainable Product Certification: **[Silver][Gold][Platinum]** level certification in accordance with NSF/ANSI 140.
 2. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
 4. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Extended Producer Responsibility: Provide documentation of manufacturer participation in an extended producer responsibility program.
 6. Life-Cycle Analysis: Provide documentation indicating product contribution to reduction in global warming potential, depletion of the stratospheric ozone layer, acidification of land and water sources, eutrophication, formation of tropospheric ozone, and depletion of nonrenewable energy resources.
 7. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- S. Performance Characteristics:
1. Texture Appearance Retention Rating (TARR): **[Moderate traffic, 2.5][Heavy traffic, 3.0][Severe traffic, 3.5]**<Insert number> minimum in accordance with ASTM D7330.
 2. Critical Radiant Flux Classification: Not less than **[0.45 W/sq. cm][0.22 W/sq. cm]** in accordance with NFPA 253.
 3. Dry Breaking Strength: Not less than **100 lbf (445 N)** in accordance with ASTM D2646.
 4. Noise Reduction Coefficient (NRC): <Insert NRC> in accordance with ASTM C423.
 5. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
 6. Colorfastness to Light: Not less than 4 after **[40][60]**<Insert number> AFU (AATCC fading units)

- in accordance with AATCC 16.3 Option 3.
7. Electrostatic Propensity: Less than **[3.5][2]<Insert number>** kV in accordance with AATCC 134.

2.3 CARPET CUSHION

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Carpenter Co.]**
 2. **[Dalton Foam; Barnhardt Manufacturing Company]**
 3. **[Dura Undercushions Ltd.]**
 4. **[Foam Products Corporation]**
 5. **[TredMOR by SCL; Leggett & Platt, Inc.]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Carpenter Co.]**
 2. **[Dalton Foam; Barnhardt Manufacturing Company]**
 3. **[Dura Undercushions Ltd.]**
 4. **[Foam Products Corporation]**
 5. **[TredMOR by SCL; Leggett & Platt, Inc.]**
 6. **<Insert manufacturer's name>**
- C. Traffic Classification: Carpet Cushion Council's **[Class I, moderate][Class II, heavy][Class III, extra-heavy]** traffic.
- D. Fiber Cushion: **[Rubberized hair, mothproofed and sterilized][Rubberized jute, mothproofed and sterilized][Synthetic][Resinated, recycled textile]**.
1. Weight: **<Insert oz./sq. yd. (g/sq. m)>**.
 2. Thickness: **<Insert inches (mm)>** plus 5 percent maximum.
 3. Density: **<Insert lb/cu. ft. (kg/cu. m)>**.
- E. Rubber Cushion: **[Flat][Rippled waffle][Textured flat][Reinforced]**.
1. Weight: **<Insert oz./sq. yd. (g/sq. m)>**.
 2. Thickness: **<Insert inches (mm)>** plus 5 percent maximum.
 3. Compression Resistance: **<Insert lb/sq. in. (kg/sq. mm)>** at **[25][65]** percent in accordance with ASTM D3676.
 4. Density: **<Insert lb/cu. ft. (kg/cu. m)>**.
- F. Polyurethane-Foam Cushion: **[Grafted prime][Densified][Bonded][Mechanically frothed]**.
1. Compression Force Deflection at 65 Percent: **<Insert lb/sq. in. (kg/sq. mm) of polymer density>** in accordance with ASTM D3574.
 2. Thickness: **<Insert inches (mm)>**.
 3. Density: **<Insert lb/cu. ft. (kg/cu. m)>**.
- G. Performance Characteristics:
1. Critical Radiant Flux Classification: Not less than **[0.45 W/sq. cm][0.22 W/sq. cm]** in accordance with NFPA 253.

2. Noise Reduction Coefficient (NRC): **<Insert NRC>** in accordance with ASTM C423.

H. Sustainable Design Requirements:

1. Sustainable Product Certification: **[Silver][Gold][Platinum]** level certification in accordance with NSF/ANSI 140.
2. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
4. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by **[carpet][carpet cushion]** manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet and that are recommended in writing or provided by **[carpet manufacturer][carpet and carpet cushion manufacturers]**.
- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104.
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended in writing by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge/Transition Strips: Extruded aluminum with **[mill]<Insert finish>** finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 1. Moisture Testing: Perform tests so that each test area does not exceed **[200 sq. ft.]**

(20 sq. m)][1000 sq. ft. (100 sq. m)]<Insert area>, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m)]<Insert emission> in 24 hours.
- b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- c. Perform additional moisture tests recommended in writing by [adhesive and carpet][adhesive, carpet cushion, and carpet] manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104 and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8 inch (3 mm)** wide or wider, and protrusions more than **1/32 inch (0.8 mm)**, unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by [adhesive and carpet][adhesive, carpet, and carpet cushion] manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and [carpet manufacturer's][carpet and carpet cushion manufacturers'] written installation instructions for the following:
 1. Direct-glue-down installation.
 2. Double-glue-down installation.
 3. Carpet with attached-cushion installation.
 4. Preapplied adhesive installation.
 5. Hook-and-loop installation.
 6. Stretch-in installation.
 7. Stair installation.
- B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.

C. Install **[pattern parallel to walls and borders]****[as indicated on Drawings]****<Insert requirements>**.

D. Install borders with mitered corner seams.

E. Do not bridge building expansion joints with carpet.

F. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet manufacturer.

G. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended in writing by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 13.7.

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer **[and carpet cushion manufacturer]****[and carpet adhesive manufacturer]****[and carpet cushion and adhesive manufacturers]**.

END OF SECTION 09 68 16 00



Task	Specification	Specification Description
09 68 16 00	09 68 13 00	Tile Carpeting



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SECTION 09 69 00 00 - ACCESS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cementitious-core steel panel access flooring.
2. Wood-core steel panel access flooring.
3. Unfilled steel panel access flooring.
4. Aluminum panel access flooring.
5. Access-floor coverings.
6. Accessories.

1.2 DEFINITIONS

- A. ESD: Electrostatic discharge. The transfer of electric charge between bodies at different potentials, from panel surface to raised access-floor substructure.
- B. UFAD: Underfloor air distribution.

1.3 COORDINATION

- A. Coordinate locations, layout, and installation of electrical and mechanical work in underfloor cavity to prevent interference with access flooring.
1. Mark pedestal locations on subfloor to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals installed after mechanical and electrical work.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
1. Review connections between access flooring and mechanical and electrical systems.
 2. Review requirements related to sealing the plenum.
 3. Review procedures for keeping underfloor space clean.

1.5 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - b. Include loading capacities.
 - c. **<Insert requirements>**.

- B. Shop Drawings:
 - 1. Layout of access flooring and relationship to adjoining Work based on field-verified dimensions.
 - 2. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish:
- D. Samples for Verification: For the following products:
 - 1. Exposed Metal Accessories: Approximately **10 inches (250 mm)** in length.
 - 2. One full-size floor panel, pedestal, and understructure unit for each type of access flooring required.
 - 3. Access-Floor Coverings: Full-size units for each color and texture specified.
- E. Delegated Design Submittals: For seismic design of access flooring, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Sustainable Design Submittals:
 - 1. Verify adhesives have a VOC content of **[70]<Insert number>** g/L or less.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with VOC requirements in California Department of Public Health (CDPH) Standard Method v1.2-2017.
 - 3. Product Data: For adhesives, indicating that product contains no urea formaldehyde.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of access flooring.
- B. Product Test Reports: For each type of access-flooring panel material[**and floor covering**], for tests performed by a qualified testing agency.
- C. Preconstruction Test Reports: For preconstruction adhesive field test.
- D. Qualification Statements: For **[Installer][delegated design engineer][and][testing agency]**.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Panels: **<Insert number>[with each type floor covering specified]**.
 - 2. Gratings: **<Insert number>**.
 - 3. Pedestals: **<Insert number>**.
 - 4. Stringers: **<Insert number>**.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in **[state]<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup **[as indicated on Drawings]<Insert mockup requirements>**.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: **[Owner will engage][Engage]** a qualified testing agency to perform preconstruction testing on field mockups.
1. **<Insert sizes and configurations of assemblies>**.
 2. Use personnel, materials, and methods of construction that will be used at Project site.
 3. Notify Architect **[seven]<Insert number>** days in advance of the dates and times when laboratory mockups will be tested.
- B. Preconstruction Adhesive Field Test: Before installing pedestals, field test their adhesion to subfloor surfaces by doing the following:
1. In areas representative of each subfloor surface, set typical pedestal assemblies in same adhesive, and use methods required for the completed Work.
 2. Allow test installation to cure for manufacturer's recommended cure time, with a pressure of **25 lbf (111 N)** applied vertically to pedestals during this period.
 3. After curing, apply lateral load against a straight steel bar inserted **2 inches (51 mm)** into pedestal stems. Measure the force needed to cause adhesive failure of pedestal base.
 4. Remove and discard failed pedestals and clean pedestals of adhered residue.
 5. Proceed with installation only after tests show compliance with performance requirement specified for pedestals' capability to resist overturning moment.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install access flooring until spaces are enclosed, **[subfloor has been sealed,]** ambient temperature is between **50 and 90 deg F (10 and 32 deg C)**, and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design access flooring for seismic performance, including loads imposed on the access flooring by items and equipment installed on the access flooring.
- B. Seismic Performance: Access flooring to withstand the effects of earthquake motions determined [in accordance with ASCE/SEI 7][as indicated on Drawings]<Insert requirement>, including loads imposed on the access flooring by items and equipment installed on the access flooring].
- C. Structural Performance: Provide access flooring capable of complying with the following performance requirements in accordance with testing procedures in CISCAs "Recommended Test Procedures for Access Floors":
 - 1. Concentrated Loads: [900 lbf (4003 N)][1000 lbf (4448 N)][1250 lbf (5560 N)][1500 lbf (6672 N)][2000 lbf (8896 N)]<Insert value> with the following deflection and permanent set:
 - a. Top-Surface Deflection: [0.10 inch (2.54 mm)]<Insert dimension>.
 - b. Permanent Set: [0.010 inch (0.25 mm)]<Insert dimension>.
 - 2. Ultimate Loads: [1800 lbf (8006 N)][2000 lbf (8896 N)][2500 lbf (11 121 N)][3000 lbf (13 345 N)][4000 lbf (17 793 N)]<Insert value>.
 - 3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch (1.02 mm).
 - a. CISCAs Wheel 1: 10 passes at [400 lbf (1779 N)][500 lbf (2224 N)][600 lbf (2669 N)][800 lbf (3559 N)][1000 lbf (4448 N)][1200 lbf (5338 N)][1250 lbf (5560 N)][2000 lbf (8896 N)]<Insert value>.
 - b. CISCAs Wheel 2: 10,000 passes at [400 lbf (1779 N)][500 lbf (2224 N)][600 lbf (2669 N)][800 lbf (3559 N)][1000 lbf (4448 N)][1250 lbf (5560 N)][1750 lbf (7784 N)][2000 lbf (8896 N)]<Insert value>.
 - 4. Stringer Load Test: [75 lbf (334 N)][225 lbf (1001 N)][350 lbf (1557 N)][450 lbf (2002 N)]<Insert value> at center of span with a permanent set not to exceed 0.010 inch (0.254 mm).
 - 5. Pedestal Axial Load Test: [5000 lbf (22 240 N)][6000 lbf (26 690 N)]<Insert value>.
 - 6. Pedestal-Overturning-Moment Test: [1000 lbf x inches (113 N x m)]<Insert values>.
 - 7. Uniform Load Test: [200 lbf/sq. ft. (9.6 kPa)][250 lbf/sq. ft. (12.0 kPa)][300 lbf/sq. ft. (14.4 kPa)][400 lbf/sq. ft. (19.2 kPa)][500 lbf/sq. ft. (23.9 kPa)]<Insert value> with a maximum top-surface deflection not to exceed 0.040 inch (1.02 mm) and a permanent set not to exceed 0.010 inch (0.254 mm).
 - 8. Drop Impact Load Test: [75 lb (34.0 kg)][100 lb (45.5 kg)][125 lb (56.7 kg)][150 lb (68.0 kg)][175 lb (79.4 kg)]<Insert value>.
- D. Fire Performance:
 - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: [25]<Insert value> or less.
 - b. Smoke-Developed Index: [50][450]<Insert value> or less.
- E. Sustainable Design Requirements:
 - 1. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
3. Verify flooring products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 CEMENTITIOUS-CORE STEEL PANEL ACCESS FLOORING

- A. Provide panels fabricated from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion using manufacturer's standard factory-applied finish. Completely fill internal spaces of completed units with manufacturer's standard cementitious material.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[ASM Modular Systems, Inc.]**
 2. **[Computer Environments, Inc.]**
 3. **[Global IFS]**
 4. **[Netfloor USA]**
 5. **[Tate Access Floors, Inc]**
 6. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[ASM Modular Systems, Inc.]**
 2. **[Computer Environments, Inc.]**
 3. **[Global IFS]**
 4. **[Netfloor USA]**
 5. **[Tate Access Floors, Inc]**
 6. **<Insert manufacturer's name>**
- D. Configuration: Provide modular panels with nominal size of **[24 by 24 inches (610 by 610 mm)]<Insert dimensions>**, interchangeable with other field panels without disturbing adjacent panels or understructure.
- E. Attachment to Understructure: **[Bolted][By gravity]**.
- F. Perforated Panels: Panels with perforated top surfaces, with **[holes][slots]** of number, spacing, and size standard with manufacturer to produce a nominal open area of **[23][24][25]<Insert number>** percent.
Provide mechanical dampers with each panel unit.
 1. Quantity: **[As indicated on Drawings]<Insert number>**.
 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.
- G. Grates: Panels with grating ribs arranged in manufacturer's standard pattern to produce a nominal open area of **[45][50][56]<Insert number>** percent.
Provide mechanical dampers with each panel unit.
 1. Quantity: **[As indicated on Drawings]<Insert number>**.

2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.

2.4 WOOD-CORE STEEL PANEL ACCESS FLOORING

- A. Provide panels fabricated with **1-inch- (25-mm-)** thick, particleboard core laminated to top and bottom steel face sheets, and with a flame-spread index of 25 or less in accordance with ASTM E84. Provide core edges enclosed with upturned, die-formed, bottom-sheet edge or with perimeter steel channel welded to top sheet and welded or bonded to bottom sheet. Protect metal surfaces against corrosion by manufacturer's standard factory-applied finish.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Bergvik North America, Inc.]**
 2. **[Computer Environments, Inc.]**
 3. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Bergvik North America, Inc.]**
 2. **[Computer Environments, Inc.]**
 3. **<Insert manufacturer's name>**
- D. Configuration: Provide modular panels with nominal size of **[24 by 24 inches (610 by 610 mm)]<Insert dimensions>**, interchangeable with other field panels without disturbing adjacent panels or understructure.
- E. Attachment to Understructure: **[Bolted][By gravity]**.
- F. Laboratory Test Reports: For particleboard, indicating compliance with requirements for low-emitting materials.
- G. Product Data: For hardwood plywood, indicating compliance with requirements for formaldehyde as specified in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products."
- H. Product Data: For particleboard, indicating that product contains no urea formaldehyde.
- I. Perforated Panels: Panels with perforated top surfaces, with **[holes][slots]** of number, spacing, and size standard with manufacturer to produce a nominal open area of **[23][24][25]<Insert number> percent.**
Provide mechanical dampers with each panel unit.
 1. Quantity: **[As indicated on Drawings]<Insert number>**.
 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.
- J. Grates: Panels with grating ribs arranged in manufacturer's standard pattern to produce a nominal open area of **[45][50][56]<Insert number> percent.**
Provide mechanical dampers with each panel unit.
 1. Quantity: **[As indicated on Drawings]<Insert number>**.
 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.

2.5 UNFILLED STEEL PANEL ACCESS FLOORING

- A. Provide panels fabricated from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion by manufacturer's standard factory-applied finish.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[ASM Modular Systems, Inc.]**
 - 2. **[Tate Access Floors, Inc]**
 - 3. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[ASM Modular Systems, Inc.]**
 - 2. **[Tate Access Floors, Inc]**
 - 3. **<Insert manufacturer's name>**
- D. Configuration: Provide modular panels with nominal size of **[24 by 24 inches (610 by 610 mm)]<Insert dimensions>**, interchangeable with other field panels without disturbing adjacent panels or understructure.
- E. Attachment to Understructure: **[Bolted][By gravity]**.
- F. Perforated Panels: Panels with perforated top surfaces, with **[holes][slots]** of number, spacing, and size standard with manufacturer to produce a nominal open area of **[23][24][25]<Insert number>** percent.**[Provide mechanical dampers with each panel unit.]**
 - 1. Quantity: **[As indicated on Drawings]<Insert number>**.
 - 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.
- G. Grates: Panels with grating ribs arranged in manufacturer's standard pattern to produce a nominal open area of **[45][50][56]<Insert number>** percent.**[Provide mechanical dampers with each panel unit.]**
 - 1. Quantity: **[As indicated on Drawings]<Insert number>**.
 - 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.

2.6 ALUMINUM PANEL ACCESS FLOORING

- A. Provide panels fabricated from manufacturer's standard aluminum alloy with equivalent strength and corrosion resistance to Alloy UNS No. A03830 or UNS No. A03840 in accordance with ASTM B85/B85M. Provide flat, solid surface on top and symmetrical crossing ribs on bottom; edge machined after casting to specified tolerances.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[ASM Modular Systems, Inc.]**
 - 2. **[Maxcess Aluminum Floors; a Computer Environments Company]**
 - 3. **<Insert manufacturer's name>**

- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[ASM Modular Systems, Inc.]**
 2. **[Maxcess Aluminum Floors; a Computer Environments Company]**
 3. **<Insert manufacturer's name>**
- D. Configuration: Provide modular panels with nominal size of **[24 by 24 inches (610 by 610 mm)]<Insert dimensions>**, interchangeable with other field panels without disturbing adjacent panels or understructure.
- E. Attachment to Understructure: **[Bolted][By gravity]**.
- F. Epoxy Finish: **[Conductive epoxy][Epoxy]** powder coating with a minimum average thickness of **2.5 mils (0.064 mm)** and in color selected from manufacturer's full range.
- G. Plated Finish: Nickel-chrome electrodeposited plating, **0.000005-inch (0.000127-mm)** chrome over **0.0008-inch (0.02-mm)** nickel, without copper or brass strike, to produce complete coverage over significant surfaces with a matte metallic appearance.
- H. Perforated Panels: Panels with perforated top surfaces, with **[holes][slots]** of number, spacing, and size standard with manufacturer to produce a nominal open area of **[16.5]<Insert number>** percent.**[Provide mechanical dampers with each panel unit.]**
1. Quantity: **[As indicated on Drawings]<Insert number>**.
 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.
- I. Grates: Panels with grating ribs arranged in manufacturer's standard pattern to produce a nominal open area of **[55]<Insert number>** percent.**[Provide mechanical dampers with each panel unit.]**
1. Quantity: **[As indicated on Drawings]<Insert number>**.
 2. Finish: **[Manufacturer's standard][To match solid panels]<Insert finish>**.

2.7 ACCESS-FLOOR COVERINGS

- A. Provide factory-applied floor finish fabricated in one piece to cover entire panel face; with **[integral trim][applied perimeter plastic]** edging.
- B. High-Pressure Plastic Laminate Tile: ISO 4586-5, Abrasion **[Class AC3][Class AC4][Class AC5]**.
1. Electrical Resistance: Average no less than 1 megohm and no more than 20 000 megohms when installed floor coverings are surface-to-ground tested in accordance with NFPA 99.
 2. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>**.
- C. Static-Dissipative Vinyl Tile: ASTM F1700, Class I (monolithic vinyl tile), Type A (smooth surface).
1. Electrical Resistance: Average no less than 1 megohm and no more than 1000 megohms when installed floor coverings are surface-to-ground tested in accordance with ASTM F150 with 100 V applied voltage.
 2. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture,**

and pattern>.

- D. Conductive Vinyl Tile: ASTM F1700, Class I (monolithic vinyl tile), Type A (smooth surface).
 - 1. Electrical Resistance: Average no less than 25 000 ohms and no more than 1 megohm when installed floor coverings are surface-to-ground tested in accordance with ASTM F150 with 100 V applied voltage.
 - 2. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**
- E. Carpet Tile: Manufacturer's standard tufted, modular carpet tile product.
 - 1. Electrostatic Propensity: Less than 3.5 kV when tested in accordance with AATCC 134.
 - 2. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**
- F. Terrazzo Tile: Manufacturer's standard terrazzo tile product.
 - 1. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**
- G. Rubber Tile: Manufacturer's standard rubber tile product.
 - 1. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**
- H. Porcelain Tile: Manufacturer's standard porcelain tile product.
 - 1. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**
- I. Hardwood Tile: Manufacturer's standard hardwood tile product.
 - 1. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color, texture, and pattern>.**

2.8 FABRICATION

- A. Fabrication Tolerances:
 - 1. Panel Size: Plus or minus **0.020 inch (0.50 mm)** of required size.
 - 2. Squareness: Plus or minus **0.015 inch (0.38 mm)** between diagonal measurements across top of panel.
 - 3. Flatness: Plus or minus **0.035 inch (0.89 mm)**, measured on a diagonal on top of panel.
- B. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

- C. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.
 - 1. Captive Fasteners: Provide fasteners held captive to panels.
- D. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.
 - 1. Number, Size, Shape, and Location: As indicated on Drawings.
 - 2. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. **[Furnish removable covers for grommets.]**
 - 3. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.9 ACCESSORIES

- A. Pedestal System Understructure: System consisting of base, column with provisions for height adjustment, and head (cap); made of **[steel][stainless steel][or][aluminum]**.
 - 1. Base: Square or circular base with not less than **[16 sq. in. (103 sq. cm)]<Insert dimension>** of bearing area.
 - 2. Column: Of height required to bring finished floor to elevations indicated. Weld column to base plate.
 - 3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than **[2 inches (51 mm)]<Insert dimension>** and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
 - 4. Head: Designed to support the floor panel indicated.
 - a. Provide sound-deadening pads or gaskets at contact points between heads and panels.
 - b. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.
- B. Stringer System Understructure: Modular **[steel][stainless steel][or][aluminum]** stringer systems designed to bolt to pedestal heads and form a grid pattern. **[Protect steel components with manufacturer's standard galvanized or corrosion-resistant paint finish.]**
 - 1. Continuous Gaskets: At contact surfaces between panel and stringers to deaden sound, seal off the underfloor cavity from above, and maintain panel alignment and position.
- C. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.
 - 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m,

and that of acetaldehyde does not exceed 9 mcg/cu. m.

- D. Post-Installed Anchors: For anchoring pedestal bases to subfloor, provide **[two][four]** post-installed **[expansion anchors][threaded concrete screws]** made from carbon steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5 (5 microns) for Class SC 1 (Mild), with the capability to sustain, without failure, a load equal to **[1.5]<Insert number>** times the loads imposed by pedestal-overturning moment on fasteners, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

- E. Service Outlets: Standard UL-listed and -labeled assemblies, for recessed mounting flush with top of floor panels; for power, communication, and signal services; and complying with the following requirements:
 - 1. Structural Performance: Cover capable of supporting a **[300 lbf (1334 N)][800 lbf (3559 N)][1000 lbf (4448 N)]** concentrated load.
 - 2. Cover and Box Type: **[Hinged polycarbonate cover with opening for passage of cables when cover is closed and including frame and steel box or formed-steel plate for mounting electrical receptacles][Grommet with twist-close cover and including steel junction box for electrical receptacle with provision for telephone connectors and signal cables]<Insert type>**.
 - 3. Location: In center of panel quadrant unless otherwise indicated.
 - 4. Receptacles and Wiring:
 - a. Electrical receptacles and wiring for service outlets are specified elsewhere.
 - b. Equip each service outlet with power receptacles to comply with the following requirements:
 - 1) Type of Receptacle: Heavy-duty duplex, two-pole, three-wire grounding, 20 A, 125 V, NEMA WD 6, Configuration 5-20R unless otherwise indicated.
 - 2) Number of Receptacles for Outlet: **[One][Two][Four]<Insert number>**.
 - 3) Factory Wired: For field hardwiring with armored cable, containing three insulated 12 AWG solid-copper conductors, terminated with a **[6-inch- (152-mm-)]<Insert dimension>** long pigtail.
 - 4) Power-in Connectors: Built into outlet housing, of type to fit power-in and power-out connectors of branch-circuit cables supplied with building electrical system.

- F. Occupant Adjustable Diffusers: Manufacturer's standard round diffusers, **[4 inches (102 mm)][8 inches (203 mm)]<Insert dimension>** in diameter, formed from **[aluminum][polycarbonate plastic]** to produce a removable one-piece unit complete with diffuser, manually adjustable flow regulator, dirt and dust receptacle, trim ring, and underfloor compression mounting ring; precisely fitted in factory-prepared openings of standard field panels and complying with the following requirements:
 - 1. Air-Distribution Characteristics: **[100 cfm (47 L/s)]<Insert value>** at **[0.096 inch wg (24 Pa)]<Insert value>** static pressure and a maximum noise criterion rating of **[15]<Insert number>**.
 - 2. Structural Performance: Capable of supporting a **[600 lbf (2669 N)]<Insert value>** concentrated load.
 - 3. Fire-Test-Response Characteristics: Classified 94V-0 in accordance with UL 94.

- G. Floor Grilles: Standard load-bearing grilles formed from **[aluminum][polycarbonate plastic]** to produce removable one-piece unit precisely fitted in factory-prepared openings of standard field panels, **[with adjustable/removable][without]** dampers and complying with the following requirements:
 - 1. Air-Distribution Characteristics: **468 cfm at 0.10 inch wg (221 L/s at 25 Pa)** static pressure.
 - 2. Structural Performance: Capable of supporting a **1000 lbf (4448 N)** concentrated load.
 - 3. Fire-Test-Response Characteristics: Classified 94V-0 in accordance with UL 94.

- H. Plenum-Wall Brush Grommets: Self-sealing cable brush grommet with **[4-by-13-inch (102-by-330-mm) rectangular][3-inch (76-mm) round][5-inch (127-mm) round]<Insert dimension(s)>** usable area for passage of power and signal cables through plenum walls. Provide **[ABS plastic][aluminum]** frame with passageway of interwoven nylon filaments and intermediate layer of EPDM. **[Provide units with plastic cable tray for support of cables and protection of wallboard.]**
- I. Cavity Dividers: Provide manufacturer's standard metal dividers located where indicated to divide underfloor cavities.
- J. Fascia Closures: Where underfloor cavity is not enclosed by abutting walls or other construction, provide metal closure plates with **[manufacturer's standard finish]<Insert finish>**.
- K. Ramps: Manufacturer's standard ramp construction of width and slope indicated, but not steeper than 1:12, with raised-disc or textured rubber or vinyl-tile floor coverings, and of same materials, performance, and construction requirements as access-flooring understructure.
- L. Steps: Manufacturer's standard steps of size and arrangement indicated with floor coverings to match adjacent access-flooring panels. Apply nonslip nosings to treads unless otherwise indicated.
- M. Railings: Manufacturer's standard railings at ramps and open-sided perimeter of access flooring where indicated. Include handrail, intermediate rails, posts, brackets, end caps, wall returns, wall and floor flanges, plates, and anchorages where required.
 - 1. Provide railings that comply with structural performance requirements specified in **[Section 055213 "Pipe and Tube Railings."][Section 057300 "Decorative Metal Railings."]**
- N. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required **[for each computer room]**.
- O. Perimeter Support: Where indicated, provide manufacturer's standard method for supporting panel edge and forming transition between access flooring and adjoining floor coverings at same level as access flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer and manufacturer's authorized representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of conditions and deleterious substances that might interfere with attachment of pedestals.
 - 2. Verify that concrete floor sealer and finish have been applied and cured.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than **6 inches (152 mm)**.

- B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

- A. Install access flooring and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.
- B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, in accordance with access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor[; **and as required to meet seismic design requirements**].
- C. Mechanical Attachment of Pedestals: Attach pedestals to subfloor with post-installed mechanical anchors in accordance with access-flooring manufacturer's written instructions[**as required to meet seismic design requirements**].
- D. Adjust pedestals so installed panels are flat, level, and at the proper height.
- E. Stringer Systems: Secure stringers to pedestal heads in accordance with access-flooring manufacturer's written instructions.
- F. Install flooring panels securely in place, leaving them properly seated with panel edges flush. Do not force panels into place.
- G. Scribe perimeter panels to provide a close fit, with adjoining construction having no voids greater than **1/8 inch (3 mm)** where panels abut vertical surfaces.
 - 1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with sealer recommended in writing by access-flooring manufacturer.
- H. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under installed access flooring.
- I. Grounded Access Flooring: Ground in accordance with access-flooring manufacturer's written instructions and as needed to comply with performance requirements for electrical resistance of floor coverings.
 - 1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.
- J. Underfloor Dividers: Scribe and install underfloor-cavity dividers to closely fit against subfloor surfaces, and seal with mastic.
- K. Closures: Scribe closures to closely fit against subfloor and adjacent finished-floor surfaces. Set in mastic and seal to maintain plenum effect within underfloor cavity.
- L. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.
- M. Seal underfloor air cavities at construction seams, penetrations, and perimeter to control air leakage, in accordance with manufacturer's written instructions.
- N. Install access flooring without change in elevation between adjacent panels and within the following

tolerances:

1. Plus or minus [1/16 inch (1.5 mm)][1/8 inch (3 mm)]<Insert dimension> in any 10 ft. (3 m) distance.
2. Plus or minus [1/8 inch (3 mm)][1/4 inch (6.5 mm)]<Insert dimension> from a level plane over entire access-flooring area.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect access-flooring components, assemblies, and equipment installations, including connections.
- B. Prepare test and inspection reports.

3.5 PROTECTION

- A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for [72]<Insert number> hours after installation, to allow pedestal adhesive to set.
- B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

3.6 DEMONSTRATION AND TRAINING

- A. [Engage a factory-authorized service representative to train][Train] Owner's maintenance personnel to adjust, operate, and maintain access flooring.
- B. Schedule demonstration and training session within [60 to 90]<Inset number> days after date of Substantial Completion.

END OF SECTION 09 69 00 00



Task	Specification	Specification Description
09 69 13 00	09 69 00 00	Access Flooring
09 69 53 00	09 69 00 00	Access Flooring



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SECTION 09 70 00 00 - STONE TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Granite.
2. Limestone.
3. Marble.
4. Quartz-based stone.
5. Serpentine.
6. Slate.
7. Travertine.
8. Setting materials.
9. Grout.
10. Pointing mortar.
11. Sealants.
12. Stone anchors and attachments.
13. Stone accessories.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing joints in interior stone trim with elastomeric sealants.
2. Section 093033 "Stone Tiling" for stone wall tile.
3. Section 097513 "Stone Wall Facing" for interior stone facing assemblies.

1.2 COORDINATION

- A. Time delivery and installation of interior stone trim to avoid extended on-site storage and to coordinate with work adjacent to interior stone trim.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site] [by web conference] <Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Show fabrication and installation details for stone trim, including dimensions and profiles of stone units.
1. Show locations and details of joints.
 2. Show locations and details of anchors, including locations of supporting construction.
- C. Samples for Initial Selection: For stone trim and joint materials involving color selection.

D. Samples for Verification:

1. For each stone type indicated, in sets of Samples not less than 12 inches (300 mm) square. Include **[two] [three] [four] [five] <Insert number>** or more Samples in each set, and show the full range of variations in appearance characteristics in completed Work.
2. For each color of **[grout] [pointing mortar] [and] [sealant]** required for jointing.

E. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for regional materials.>
2. <Double click to insert sustainable design text for adhesives.>

1.5 INFORMATIONAL SUBMITTALS**A. Qualification Data: For [Fabricator] [and] [Installer].****B. Material Test Reports:**

1. Stone Test Reports: For **[each]** stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, in accordance with referenced ASTM standards. Base reports on testing done within previous **[three] [five] <Insert number>** years.
2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer, indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone trim units similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: **[Fabricator of stone trim units] [or] [a firm or individual experienced in installing stone trim units similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance].**

1.7 MOCKUPS

- A. Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 1. Build mockup of typical wall area as shown on Drawings.
 2. Build mockups for typical interior stone trim as shown on Drawings.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Adhesion and Compatibility Testing: Submit Samples of materials that will contact or affect joint sealants, to joint-sealant manufacturers, for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical units, so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.10 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.
- B. Field Measurements: Verify dimensions of construction to receive interior stone trim by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain[**each variety of**] stone, [**regardless of finish,**] from a single quarry[, **whether specified in this Section or in another Section of the Specifications,**] with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
- B. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources in accordance with Section 044200 "Exterior Stone Cladding."
- C. Stone Fabricators: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available fabricators whose products may be incorporated into the Work include, but are not limited to, the following**]:
 - 1. <Insert, in separate subparagraphs, names and possibly contact information for preapproved stone fabrication firms>.

2.2 GRANITE

- A. Trim Application: Granite [flat trim] [casing] [base] [corners] [wainscots] [ledges] [wall caps] [window stools] [and] [surrounds] <Insert trim application>.
- B. Material Standard: Comply with ASTM C615/C615M.
 - 1. <Double click to insert sustainable design text for stone.>
- C. Description: Uniform, [fine] [medium]-grained, [white] [pink] [gray] [black] <Insert color> stone [without veining].
- D. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- E. Cut: [Vein] [Fleuri].
 - 1. Orientation of Veining: [Horizontal] [Vertical] [As indicated on Drawings].
- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Finish: [Polished] [Honed] [Thermal] [As indicated on Drawings] [Match existing] <Insert finish>.
- H. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- I. Dimensions:
 - 1. Nominal Thickness: [3/4 inch (20 mm)] [7/8 inch (22 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (40 mm)] [As indicated on Drawings].
 - 2. Edge Detail: [Straight, slightly eased at corners] [3/8-inch (10-mm) bevels] [3/4-inch (20-mm) radii] [3/8-inch (10-mm) radii] [As indicated on Drawings].
 - 3. Joints: [1/16-inch- (1.5-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, sealant-filled joints] [Bonded joints, 1/32 inch (0.8 mm) or less in width].

2.3 LIMESTONE

- A. Trim Application: Limestone [flat trim] [casing] [base] [corners] [wainscots] [ledges] [wall caps] [window stools] [and] [surrounds] <Insert trim application>.
- B. Material Standard: Comply with ASTM C568/C568M.
 - 1. Classification: [I Low] [II Medium] [III High] Density.
 - 2. <Double click to insert sustainable design text for stone.>
- C. Description: [Shell] [Oolitic] [Dolomitic] limestone.
- D. Varieties and Sources:

1. Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
 2. Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 - a. Indiana Oolitic Limestone Grade and Color: **[Select, buff]** **[Select, gray]** **[Standard, buff]** **[Standard, gray]** **[Rustic, buff]** **[Rustic, gray]** **[Variegated]**, in accordance with grade and color classification established by ILI.
- E. Cut: **[Vein]** **[Fleuri]**.
1. Orientation of Veining: **[Horizontal]** **[Vertical]** **[As indicated on Drawings]**.
- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Finish: **[Smooth]** **[Sand rubbed]** **[Machine tooled, four bats per 1 inch (25 mm)]** **[Machine tooled, six bats per 1 inch (25 mm)]** **[Machine tooled, eight bats per 1 inch (25 mm)]** **[As indicated on Drawings]** **[Match existing]** **<Insert finish>** **[, matching standard ILI finish]**.
- H. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- I. Dimensions:
1. Nominal Thickness: **[3/4 inch (20 mm)]** **[7/8 inch (22 mm)]** **[1-1/4 inches (32 mm)]** **[1-1/2 inches (40 mm)]** **[As indicated on Drawings]**.
 2. Edge Detail: **[Straight, slightly eased at corners]** **[3/8-inch (10-mm) bevels]** **[3/4-inch (20-mm) radii]** **[3/8-inch (10-mm) radii]** **[As indicated on Drawings]**.
 3. Joints: **[1/16-inch- (1.5-mm-) wide, grouted joints]** **[1/8-inch- (3-mm-) wide, grouted joints]** **[1/8-inch- (3-mm-) wide, sealant-filled joints]** **[Bonded joints, 1/32 inch (0.8 mm) or less in width]**.

2.4 MARBLE

- A. Trim Application: Marble **[flat trim]** **[casing]** **[base]** **[corners]** **[wainscots]** **[ledges]** **[wall caps]** **[window stools]** **[and]** **[surrounds]** **<Insert trim application>.**
- B. Material Standard: Comply with ASTM C503/C503M[, **Classification I Calcite**] **[, Classification II Dolomite]** **[, Group A]** **[, Group B]** **[, Group C]** **[, Group D]**.
 1. **<Double click to insert sustainable design text for stone.>**
- C. Description: Uniform, fine- to medium-grained, **[white]** **<Insert color>** stone with only slight veining.
- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**

- E. Cut: **[Vein] [Fleuri]**.
 - 1. Orientation of Veining: **[Horizontal] [Vertical] [As indicated on Drawings]**.
- F. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- G. Finish: **[Polished] [Honed] [As indicated on Drawings] [Match existing] <Insert finish>**.
- H. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- I. Dimensions:
 - 1. Nominal Thickness: **[3/4 inch (20 mm)] [7/8 inch (22 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (40 mm)] [As indicated on Drawings]**.
 - 2. Edge Detail: **[Straight, slightly eased at corners] [3/8-inch (10-mm) bevels] [3/4-inch (20-mm) radii] [3/8-inch (10-mm) radii] [As indicated on Drawings]**.
 - 3. Joints: **[1/16-inch- (1.5-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, sealant-filled joints] [Bonded joints, 1/32 inch (0.8 mm) or less in width]**.

2.5 QUARTZ-BASED STONE

- A. Trim Application: Quartz-based stone **[flat trim] [casing] [base] [corners] [wainscots] [ledges] [wall caps] [window stools] [and] [surrounds] <Insert trim application>**.
- B. Material Standard: Comply with ASTM C616/C616M, **[Classification I Sandstone] [Classification II Quartzitic Sandstone] [Classification III Quartzite] [, except for minimum free silica content]**.
 - 1. <Double click to insert sustainable design text for stone.>
- C. Description: **[Tan] [Brown] [Black] [Yellow] [Gray] [White] [Green] [Purple] [Red]** quartz-based stone.
- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Brownstone] [Bluestone] [Flagstone] [Silver quartzite] [White quartzite] [Golden quartzite]**.
 - 2. **<Insert, in separate subparagraphs, names of additional varieties and producers, distributors, or importers>**.
- E. Cut: **[Sawcut] [Split face]**.
- F. Finish: **[Honed] [Sandblasted] [Bush-hammered] [Polished] [As indicated on Drawings] [Match existing] <Insert finish>**.
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- H. Dimensions:
 - 1. Nominal Thickness: **[1/2 inch (12.7 mm)] [3/4 inch (20 mm)] [7/8 inch (22 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (40 mm)] [As indicated on Drawings]**.

2. Edge Detail: [Straight, slightly eased at corners] [3/8-inch (10-mm) bevels] [3/4-inch (20-mm) radii] [3/8-inch (10-mm) radii] [As indicated on Drawings].
3. Joints: [1/16-inch- (1.5-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, sealant-filled joints] [Bonded joints, 1/32 inch (0.8 mm) or less in width].

2.6 SERPENTINE

- A. Trim Application: Serpentine [flat trim] [casing] [base] [corners] [wainscots] [ledges] [wall caps] [window stools] [and] [surrounds] <Insert trim application>.
- B. Material Standard: Comply with ASTM C1526, [Classification I Exterior] [Classification II Interior].
 1. <Double click to insert sustainable design text for stone.>
- C. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
- D. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- E. Finish: [Polished] [Honed] [As indicated on Drawings] [Match existing] <Insert finish>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- G. Dimensions:
 1. Nominal Thickness: [3/4 inch (20 mm)] [7/8 inch (22 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (40 mm)] [As indicated on Drawings].
 2. Edge Detail: [Straight, slightly eased at corners] [3/8-inch (10-mm) bevels] [3/4-inch (20-mm) radii] [3/8-inch (10-mm) radii] [As indicated on Drawings].
 3. Joints: [1/16-inch- (1.5-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, sealant-filled joints] [Bonded joints, 1/32 inch (0.8 mm) or less in width].

2.7 SLATE

- A. Trim Application: Slate [flat trim] [casing] [base] [corners] [wainscots] [ledges] [wall caps] [window stools] [and] [surrounds] <Insert trim application>.
- B. Material Standard: Comply with ASTM C629/C629M, [Classification I Exterior] [Classification II Interior].
 1. <Double click to insert sustainable design text for stone.>
- C. Description: [Black] [Blue-black] [Gray] [Blue-gray] [Green] [Purple] [Mottled purple and green] [Red] slate with a fine, even grain[and unfading color,] from clear, sound stock.

- D. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- E. Finish: **[Honed]** **[Sand rubbed]** **[Natural cleft]** **[As indicated on Drawings]** **[Match existing]** **<Insert finish>.**
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- G. Dimensions:
1. Nominal Thickness: **[3/4 inch (20 mm)]** **[7/8 inch (22 mm)]** **[1-1/4 inches (32 mm)]** **[1-1/2 inches (40 mm)]** **[As indicated on Drawings].**
 2. Edge Detail: **[Straight, slightly eased at corners]** **[3/8-inch (10-mm) bevels]** **[3/4-inch (20-mm) radii]** **[3/8-inch (10-mm) radii]** **[As indicated on Drawings].**
 3. Joints: **[1/16-inch- (1.5-mm-) wide, grouted joints]** **[1/8-inch- (3-mm-) wide, grouted joints]** **[1/8-inch- (3-mm-) wide, sealant-filled joints]** **[Bonded joints, 1/32 inch (0.8 mm) or less in width].**

2.8 TRAVERTINE

- A. Trim Application: Travertine **[flat trim]** **[casing]** **[base]** **[corners]** **[wainscots]** **[ledges]** **[wall caps]** **[window stools]** **[and]** **[surrounds]** **<Insert trim application>.**
- B. Material Standard: Comply with ASTM C1527/C1527M, **[Classification I Exterior]** **[Classification II Interior].**
1. **<Double click to insert sustainable design text for stone.>**
- C. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**
- D. Cut: **[Vein]** **[Fleuri].**
1. Orientation of Veining: **[Horizontal]** **[Vertical]** **[As indicated on Drawings].**
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Filling: Fill pores on faces of stone with cementitious filler of color **[selected by Architect]** **[matching Architect's sample].**
- G. Finish: **[Polished]** **[Honed]** **[As indicated on Drawings]** **[Match existing]** **<Insert finish>.**
- H. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- I. Dimensions:

1. Nominal Thickness: [3/4 inch (20 mm)] [7/8 inch (22 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (40 mm)] [As indicated on Drawings].
2. Edge Detail: [Straight, slightly eased at corners] [3/8-inch (10-mm) bevels] [3/4-inch (20-mm) radii] [3/8-inch (10-mm) radii] [As indicated on Drawings].
3. Joints: [1/16-inch- (1.5-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, grouted joints] [1/8-inch- (3-mm-) wide, sealant-filled joints] [Bonded joints, 1/32 inch (0.8 mm) or less in width].

2.9 SETTING MATERIALS

- A. Molding Plaster: ASTM C59/C59M.
- B. Portland Cement: ASTM C150/C150M, Type I or Type II.
 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested in accordance with ASTM C114.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Aggregate: ASTM C144.
- E. Water: Potable.
- F. Adhesives, General: Use only adhesives formulated for stone and ceramic tile and recommended by their manufacturer for the application indicated.
- G. Organic Adhesive: ANSI A136.1, Type I.
 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. <Double click to insert sustainable design text for low emitting adhesives.>
- H. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.
 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. <Double click to insert sustainable design text for VOC content of adhesive.>
- I. Stone Adhesive: Two-part, [epoxy-resin] [or] [polyester-resin] stone adhesive with an initial set time of not more than two hours at 70 deg F (21 deg C).
 1. Color: [Clear] [Match stone].
 2. Epoxy Adhesive:
 - a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 3. Polyester Adhesive:
 - a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 4. <Double click to insert sustainable design text for VOC content of adhesive.>

2.10 GROUT

- A. Grout Colors: **[Match stone] [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range].**
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6, packaged.
 - 1. Grout Type: **[Sanded] [Unsanded].**
- D. High-Performance Cement Grout: ANSI A118.7, packaged.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Polymer Additive Type: **[Acrylic resin] [or] [ethylene vinyl acetate]. [In dry, redispersible form, packaged with other dry ingredients] [In liquid-latex form for addition to packaged dry-grout mix].**
 - 3. Grout Type: **[Sanded] [Unsanded].**
- E. Water-Cleanable Epoxy Grout: ANSI A118.3, packaged, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.11 POINTING MORTAR

- A. Portland Cement: ASTM C150/C150M, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Pigments are to have a record of satisfactory performance in mortar.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments should not exceed 10 percent of portland cement by weight.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- F. Aggregate: ASTM C144, except with 100 percent passing No. 16 (1.18-mm) sieve.
 - 1. White Aggregates: Natural white sand or ground white stone.

2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

G. Water: Potable.

2.12 SEALANTS

- A. Joint Sealants: Manufacturer's standard sealants that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone to which they are applied.
 1. Use mildew-resistant joint sealant at plumbing fixtures and for control and expansion joints in toilet rooms[**and other wet locations**].
 2. Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.
- B. Sealant for Filling Kerfs: [**Same sealant used for joints in stone cladding.**] [**Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and that do not stain stone:**]
 1. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. Urethane, M, NS, 25, T, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - a. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.13 STONE ANCHORS AND ATTACHMENTS

- A. Stainless Steel Anchors: ASTM A240/A240M or ASTM A666/A666M, Type 304.
 1. Fasteners for Stainless Steel Anchors: Annealed stainless steel bolts, nuts, and washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1 (A1).
- B. Stainless Steel Dowels: ASTM A276/A276M, Type 304.
- C. Extruded-Aluminum Anchors: ASTM B221 (ASTM B221M), Alloy 6063-T6.
 1. Fasteners for Extruded-Aluminum Anchors: Annealed stainless steel bolts, nuts, and washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1 (A1).
- D. Wire Tiebacks: [**No. 9 AWG copper or copper-alloy**] [or] [**0.120-inch- (3.0-mm-) diameter, stainless steel**] wire.

2.14 STONE ACCESSORIES

- A. Temporary Setting Shims: Rigid plastic shims, nonstaining to stone, sized to suit joint thickness.

- B. Stone Cleaner: Cleaning system compound and accessories specifically formulated for stone types, finishes, and applications indicated, as recommended in writing by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- C. Stone Sealer: Colorless, stain-resistant sealing solution that does not affect color or physical properties of stone surfaces, as recommended in writing by stone producer for application indicated.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. <Double click to insert sustainable design text for sealant.>

2.15 FABRICATION OF STONE TRIM, GENERAL

- A. Select stone for intended use free from damage, cracks, and starts that could impair structural integrity or function.
 - 1. Repairs that are characteristic of the stone varieties specified may be acceptable, provided they do not impair structural integrity or function and are aesthetically acceptable, as judged by Architect.
- B. Fabricate stone trim in sizes and shapes required to comply with requirements indicated.
 - 1. Comply with published recommendations in NSI's "Dimension Stone Design Manual."
 - 2. For limestone, comply with published recommendations in ILI's "Indiana Limestone Handbook."
- C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
 - 1. Where items are installed with adhesive or where stone edges are visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
 - 2. Clean sawed backs of stones to remove rust stains and iron particles.
 - 3. Dress joints straight and at right angle to face unless otherwise indicated.
 - 4. Cut and drill sinkages and holes in stone for anchors, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
- D. Fabricate molded work to produce stone shapes with a uniform profile throughout entire unit length and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units.
 - 1. Produce moldings with machines having abrasive shaping wheels made to reverse contour of molding shape; do not sculpt moldings.
 - 2. Miter moldings at corners, unless otherwise indicated, with edges of miters slightly eased at outside corners.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups.
- F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples[**and mockups**].

- G. Stone Base: **[Locations as indicated on Drawings] [Locate joints at midpoints between adjacent paneling joints unless otherwise indicated].**
- H. Stone Window Stools: Fabricate window stools in one piece unless otherwise indicated.
 - 1. Assemble window stools that consist of more than one piece by bonding joints with stone adhesive. Mask areas adjacent to joints to prevent adhesive smears. Clamp units to temporary bracing to ensure that window stools are properly aligned and joints are minimum width.

2.16 MIXES

- A. Spotting Plaster: Stiff mix of molding plaster and water.
- B. Mortar, General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
 - 2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- C. Setting Mortar: Comply with ASTM C270, Proportion Specification.
 - 1. Type: **[Type N] [Type O].**
 - 2. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.
- D. Grout: Comply with mixing requirements of referenced ANSI standards and with manufacturer's written instructions.
- E. Pointing Mortar: Comply with ASTM C270, Proportion Specification, for mortar types indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:
 - 1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
 - 2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
 - 3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
 - 4. Type: **[Type N] [Type O].**
 - 5. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times the volume of cement and lime.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone trim.

- B. Verify suitability of substrates, including surface conditions and compatibility. Proceed with stone trim installation only after unsatisfactory conditions have been corrected.

1. Installation of stone trim indicates acceptance of substrates and conditions.

3.2 PREPARATION

- A. Clean substrate surfaces that are dirty or stained by removing soil, stains, and foreign materials.
- B. Clean stone trim with stone cleaner by thoroughly scrubbing with fiber brushes and then drenching with clear water.

3.3 SETTING STONE TRIM, GENERAL

- A. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- B. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.
- C. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned in accordance with established relationships and indicated tolerances.
- D. Erect stone units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.
- E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 1. Sealing of expansion and other joints is specified in Section 079200 "Joint Sealants."
 2. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch (6 mm) maximum.
- B. Variation from Level: For lintels, sills, window stools, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 ft. (3 mm in 3 m), 1/4 inch in 20 ft. (6 mm in 6 m), or 3/8 inch (10 mm) maximum.
- C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/8 inch in 10 ft. (3 mm in 3 m), 1/4 inch in 20 ft. (6 mm in 6 m), or 3/8 inch (10 mm) maximum.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/8 inch (3 mm).

- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/16 inch (1.5 mm) or one-fourth of nominal joint width, whichever is less.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

3.5 INSTALLATION OF STONE TRIM

A. Stone Trim at Stone Paneling:

- 1. Set units by adhering to stone paneling with water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- 2. Set units firmly against setting spots. Locate setting spots at anchors and spaced not more than 18 inches (450 mm) apart unless otherwise indicated. Provide no fewer than two anchors per piece for stone trim up to 48 inches (1200 mm) in length, plus one additional anchor for each additional 24 inches (600 mm) of length.

B. Stone Trim at Gypsum Board:

- 1. Adhere units to plywood backing with full spread of water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- 2. Adhere units to gypsum board with full spread of **[organic] [water-cleanable epoxy]** adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

C. Stone Base at Stone Paneling:

- 1. Set units by adhering to stone paneling with water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- 2. Set units firmly against setting spots. Locate setting spots at anchors and spaced not more than 18 inches (450 mm) apart unless otherwise indicated. Provide no fewer than two anchors per piece for stone base up to 48 inches (1200 mm) in length, plus one additional anchor for each additional 24 inches (600 mm) of length.

D. Stone Base at Gypsum Board:

- 1. Adhere units to plywood backing with full spread of water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.
- 2. Adhere units to gypsum board with full spread of **[organic] [water-cleanable epoxy]** adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

E. Stone Window Stools:

- 1. Set stone window stools on masonry in a full bed of mortar.
- 2. Set stone window stools on wood or metal framing or wood blocking in a full bed of **[organic] [water-cleanable epoxy]** adhesive. Hold adhesive back from exposed edges of joints to allow for **[grouting] [pointing with sealant]**.

- F. Assemble indicated multiple-piece units by bonding joints with stone adhesive as units are set. Mask areas adjacent to joints to prevent adhesive smears. Clamp units in place to ensure that surfaces are properly aligned and joints are minimum width.

- G. **[Grout] [Point]** joints after setting stone trim.

- H. Fill **[indicated]** joints with sealant after setting **[and grouting] [and pointing]** stone.

3.6 GROUTING JOINTS

- A. Remove temporary shims before grouting.
- B. Grout stone to comply with ANSI A108.10.
 - 1. Use sanded grout mixture for joints wider than 1/8 inch (3 mm).
 - 2. Use unsanded grout mixture for joints 1/8 inch (3 mm) and narrower.
- C. Tool joints uniformly and smoothly with plastic tool.

3.7 POINTING JOINTS

- A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than 1/2 inch (13 mm).
- B. Point stone joints by placing pointing mortar in layers of not more than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.
- C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter 1/8 inch (3 mm) larger than width of joint.

3.8 INSTALLATION OF JOINT SEALANT AT JOINTS

- A. Remove temporary shims before applying sealants.
- B. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.9 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean interior stone trim as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace interior stone trim of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged or defective stone. Stone may be repaired if methods and results are approved in advance by Architect.
 - 2. Defective joints, including misaligned joints.
 - 3. Interior stone trim and joints not matching approved Samples and mockups.
- C. Replace in a manner that results in interior stone trim that matches approved Samples and mockups, complies with other specified requirements, and shows no evidence of replacement.
- D. Clean interior stone trim no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

- E. Apply stone sealer in accordance with stone producer's and sealer manufacturer's written instructions and recommendations.

3.10 PROTECTION

- A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.
- B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

END OF SECTION 09 70 00 00



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SECTION 09 70 00 00A - STRETCHED-FABRIC WALL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes site-upholstered wall systems.
- B. Related Requirements:
 - 1. Section 095443 "Stretched-Fabric Ceiling Systems" for site-upholstered systems applied to ceilings[**and for coordinated requirements for fabric**].
 - 2. Section 097200 "Wall Coverings" for adhesively applied textile wall coverings[**and for coordinated requirements for fabric**].
 - 3. Section 097723 "Fabric-Wrapped Panels" for decorative, fabric-wrapped wall panels that are not required to be tested for acoustical performance[**and for coordinated requirements for fabric**].
 - 4. Section 098433 "Sound-Absorbing Wall Units" for shop-fabricated, acoustical wall panels tested for acoustical performance[**and for coordinated requirements for fabric**].

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include[**fabric facing**,] frame edge and trim, core material, and mounting indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 6. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
 - 7. Product Data: For composite wood products, indicating that product contains no urea

- formaldehyde.
8. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
9. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
10. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each stretched-fabric system.

1. Include plans, elevations, sections, and installation and system details.
2. Include details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame-edge profile and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include direction of fabric weave and pattern matching.
5. Show sewn-seam locations, types, and methods.

D. Samples for Initial Selection: For each type of fabric facing.

1. Include Samples of accessories involving color or finish selection.

E. Samples for Verification: For the following products:

1. Fabric: Full-width by approximately **[36-inch- (900-mm-)]<Insert dimension>** long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Frame System: **12-inch- (300-mm-)** square Sample(s) showing each edge profile and corner.
3. Core Material: **12-inch- (300-mm-)** square Sample at corner.
4. Assembled System: Approximately **36 by 36 inches (900 by 900 mm)**, including joints[**and seams**] in mockup.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by stretched-fabric systems including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. **<Insert item>**.
3. Show operation of hinged and sliding components covered by or adjacent to stretched-fabric systems.

B. Qualification Data: For Installer.

- C. Product Certificates: For each type of stretched-fabric system.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fabric: For each fabric, color, and pattern installed, furnish length equal to **[10]<Insert number>** percent of amount installed, but no fewer than **[10 sq. yd. (9 sq. m)]<Insert quantity>**, full width of bolt.
 - 2. Framing and Related Installation Items: Furnish manufacturer's full-length units equal to **[5]<Insert number>** percent of amount installed, but no fewer than **[five]<Insert number>** units, including unopened adhesives.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area **[as shown on Drawings][48 inches (1200 mm) wide by full height]<Insert dimensions>.[Include intersection of wall and ceiling, corners, and perimeters.]**
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.



- B. Lighting: Do not install stretched-fabric systems until **[a permanent level of lighting][a lighting level of not less than 50 fc (538 lx)]<Insert requirement>** is provided on surfaces to receive stretched-fabric systems.
- C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.11 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain stretched-fabric wall systems specified in this Section **[and stretched-fabric systems specified in Section 095443 "Stretched-Fabric Ceiling Systems"]** from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Fire-Test-Response Characteristics: Stretched-fabric wall systems are to comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency on systems prepared according to ASTM E2573. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 STRETCHED-FABRIC WALL SYSTEMS

- A. Stretched-Fabric Wall System : Manufacturer's standard system consisting of facing material stretched tightly over a frame **[and core material]** and secured in the frame.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Accutrack Systems, LLC]**
 - b. **[Acoustical Fabric Systems Inc]**
 - c. **[Acoustical Solutions]**
 - d. **[DFB Sales, Inc.]**
 - e. **[Fabricmate Systems, Inc.]**
 - f. **[FabriTrak Systems, Inc]**
 - g. **[Novawall Systems, Inc]**
 - h. **[SnapTex International LLC]**
 - i. **[SoftWalls, Inc.]**
 - j. **[Wallmate; Fabric Wallmount Systems, Inc.]**
 - k. **[Whisper Walls]**
 - l. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Accutrack Systems, LLC]**
 - b. **[Acoustical Fabric Systems Inc]**
 - c. **[Acoustical Solutions]**
 - d. **[DFB Sales, Inc.]**
 - e. **[Fabricmate Systems, Inc.]**
 - f. **[FabriTrak Systems, Inc]**
 - g. **[Novawall Systems, Inc]**
 - h. **[SnapTex International LLC]**
 - i. **[SoftWalls, Inc.]**
 - j. **[Wallmate; Fabric Wallmount Systems, Inc.]**
 - k. **[Whisper Walls]**
 - l. **<Insert manufacturer's name>**
3. Core: **[Manufacturer's standard][Glass-fiber board][Glass-fiber blanket][Mineral-fiber board][Cementitious-fiber board][Medium-density fiberboard][Particleboard]<Insert requirement>.[Provide wood or plywood nailing strips in core where indicated.]**
 - a. Core-Face Layer: Manufacturer's standard **[tackable, impact-resistant, high-density**

- board][impact-resistant, acoustically transparent, copolymer sheet]<Insert requirement>.
- b. Nominal Core Thickness: [Match nominal frame thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.
4. Core Overlay: Polyester batting [1/2 inch (13 mm) thick][Manufacturer's standard thickness]<Insert dimension>.
 5. Frame Edge: [Chamfered (beveled)][Radiused (bullnosed)][Square]<Insert profile> profile.
 - a. Fabric-Insertion Point: [Bottom load][Side load][Top load].
 - b. Nominal Frame Thickness: [Match nominal core thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.
 6. Frame Color: [Natural][Black][White][Prepainted color as selected by Architect from full range of manufacturer's colors]<Insert requirement>.
 7. Reveals between Panels: [Recessed][Flush][Projecting] reveals [as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.
 8. Facing Material: [Owner-furnished material][As indicated on Drawings]<Insert drawing designation>.
 9. Acoustical Performance: Sound absorption [NRC][or][SAA] of [0.50 to 0.90][0.60 to 0.70][0.65 to 0.75][not less than 0.65][not more than 0.35]<Insert range or single value> according to ASTM C423 for [Type A]<Insert type> mounting according to ASTM E795.
 10. Nominal Overall System Thickness: [Match nominal frame thickness][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (51 mm)][As indicated on Drawings]<Insert dimension>.

2.4 MATERIALS

A. Sustainable Design Requirements:

1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
4. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
5. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Core Materials:[Manufacturer's standard.]

1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of [6 to 7 lb/cu. ft. (96 to 112 kg/cu. m)]<Insert value>, unfaced, and dimensionally stable, molded rigid

- board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Glass-Fiber Blanket: ASTM C553, ASTM C612, or ASTM C665; of type standard with manufacturer; nominal density of **[3 to 4 lb/cu. ft. (48 to 64 kg/cu. m)]<Insert value>**; flexible; **with tackable, thermally bonded white glass-fiber mat facing;** and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
3. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of **[13 lb/cu. ft. (208 kg/cu. m)][20 lb/cu. ft. (320 kg/cu. m)]**, and with perforated surface.
4. Cementitious-Fiber Board: Density of not less than **[20 lb/cu. ft. (320 kg/cu. m)]<Insert value>**.
5. Medium-Density Fiberboard: Panels complying with ANSI A208.2, **[grade to suit performance requirements][Grade 130]<Insert grade>**.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84 or UL 723.
6. Particleboard: Panels complying with ANSI A208.1, **[grade to suit performance requirements][Grade M-2]<Insert grade>**.
 - a. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E84 or UL 723.
7. Tackable, Impact-Resistant, High-Density Board for Face Layer: **1/8-inch- (3.2-mm-)** thick layer of compressed molded glass-fiber board with a nominal density of **16 to 18 lb/cu. ft. (256 to 288 kg/cu. m)** laminated to face of core.
8. Core Overlay: Flame-retardant, compressible, fiberfill, polyester batting.
9. Impact-Resistant, Acoustically Transparent, Copolymer Sheet for Face Layer: **1/16- to 1/8-inch- (1.6- to 3.2-mm-)** thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.
10. Wood and Plywood: Manufacturer's standard plywood or clear, vertical grain, straight, kiln-dried hardwood.
 - a. Fire-retardant treated by pressure process with a flame-spread index of 25 or less when tested according to ASTM E84 or UL 723, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than **10.5 feet (3.2 m)** beyond the centerline of the burners at any time during the test.
 - 1) Treated material is to have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity.
 - 2) Kiln-dry material after treatment to 7 to 13 percent or less for lumber and 15 percent or less for plywood.
- C. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).
- D. Facing Material : Fabric from same dye lot; color and pattern **[as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>**.
 1. Manufacturer: **<Insert manufacturer's name>**.
 2. Product Line/Pattern: **<Insert product name or designation>**.
 3. Pattern Repeat: **<Insert requirement>**.
 4. Style Number: **<Insert number>**.
 5. Color: **<Insert name or number, or both>**.

6. Fiber Content: [100]<Insert number> percent [woven polyester][nonwoven polyester][polyolefin][acoustically transparent vinyl]<Insert fiber requirement>.
7. Width: [54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>.
8. Source: <Insert fabric-vendor's name>.
9. Applied Treatments: [Stain resistance][flame retardant][acrylic backing, single coat][acrylic backing, double coat][latex backing][foam backing][and][knit backing]<Insert treatment>.
10. Lining Material: [Manufacturer's standard fabric for each use indicated]<Insert material designation>.
11. Trim Strip: <Insert material designation>.

- E. Lining Material <Insert material designation>: Fabric [as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>.

1. Manufacturer: <Insert manufacturer's name>.
2. Product Line: <Insert product name or designation>.
3. Style Number: <Insert number>.
4. Color: [White]<Insert name or number, or both>.
5. Fiber Content: <Insert content by percentage and fiber type>.
6. Width: [54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>.
7. Source: <Insert fabric-vendor's name>.
8. Applied Treatments: [Stain resistance][and][flame retardant]<Insert treatment>.

- F. Trim Strip <Insert material designation>: Fabric [matching facing material except as follows]<Insert requirement>.

1. Product Line: <Insert product name or designation>.
2. Style Number: <Insert number>.
3. Color: [White]<Insert name or number, or both>.

2.5 INSTALLATION MATERIALS

- A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:

1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

7. Fasteners: **[Manufacturer's standard]<Insert requirement>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each area and establish layout of panels and joints of **[uniform size with balanced borders at opposite edges][sizes indicated on Drawings]** within a given area.
- B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of **[24]<Insert number>** hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION

- A. Install stretched-fabric systems according to system manufacturer's written instructions.
 - 1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.
 - 2. Install framing around penetrations.
 - 3. Tightly fit framing to adjacent construction and securely attach to substrate.
 - 4. Install core material with full coverage, flush with face of stretched-fabric system frame.
 - 5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.
 - 6. Install stretched-fabric systems level and plumb unless otherwise indicated, true in plane, and with fabric square to the grain.
 - 7. Install jointed panels with **[butt joints][and][reveals]<Insert requirement>** as indicated.
 - 8. Provide wood or plywood nailing strips and blocking as indicated on Drawings.
 - 9. Provide continuous **6-inch- (150-mm-)** wide by **[1-inch- (25-mm-) thick, wood][3/4-inch- (19-mm-) thick, plywood]** nailing strips and blocking attached to supporting substrate with suitable fasteners for hanging artwork, centered at **60 inches (1524 mm)** above finish floor, unless otherwise indicated.
- B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
 - 1. Fabric Direction: Run fabric **[railroaded][up the bolt]<Insert direction>**.
 - 2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
 - 3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave **[aligns with adjacent panels][varies from adjacent panels as indicated on Drawings]**.
 - 4. Fabric Seams:

- a. Sewn seams are not permitted.
 - b. **[Manufacturer's standard][Flat standard][French][Welt-trimmed]<Insert description>** sewn seams, straight and parallel; seam dimensions and locations as indicated on Drawings.
- 5. Core Overlay: Evenly stretch over core face and edges; free from puckers, ripples, wrinkles, and sags.
 - 6. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.
 - 7. Stretch fabric tightly and square without puckers, ripples, or distortions. Acclimatize and restretch if recommended by stretched-fabric system manufacturer. Repair distortions, wrinkles, and sagging.
 - 8. Trim Strip: Back-wrap trim strip fabric from the fabric-insertion point over the exposed part of the frame edge where indicated, resulting in a contrasting fabric along the edge.

3.4 INSTALLATION TOLERANCES

- A. Edge Straightness: Plus or minus **[1/16 inch (1.6 mm)]<Insert dimension>** in **48 inches (1200 mm)**.
- B. Variation from Level and Plumb: Plus or minus **[1/16 inch (1.6 mm)]<Insert dimension>** in **48 inches (1200 mm)**, noncumulative.
- C. Variation of Joint Width: Not more than **[1/16 inch (1.6 mm)]<Insert dimension>** in **48 inches (1200 mm)** from **[hairline][reveal line]**, noncumulative.

3.5 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 70 00 00A

SECTION 09 70 00 00B - FABRIC-WRAPPED PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shop-fabricated, fabric-wrapped wall panels.
- B. Related Sections:
 - 1. Section 097200 "Wall Coverings" for adhesively applied textile wall coverings[**and for coordinated requirements for fabric**].
 - 2. Section 097713 "Stretched-Fabric Wall Systems" for site-upholstered systems applied to walls[**and for coordinated requirements for fabric**].
 - 3. Section 098433 "Sound-Absorbing Wall Units" for shop-fabricated, acoustical wall panels tested for acoustical performance[**and for coordinated requirements for fabric**].

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include[**fabric facing,**] panel edge, core material, and mounting indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declaration (EPD): For each product.
 - 4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 5. Environmental Product Declaration: For each product.
 - 6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
 - 7. Environmental Product Declaration: For each product.
 - 8. Environmental Product Declaration: For each product.
 - 9. Third-Party Certifications: For each product.
 - 10. Third-Party Certified Life Cycle Assessment: For each product.
 - 11. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 12. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 13. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 14. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting

- materials.
- 15. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- 16. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 17. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 18. Product Data: For installation adhesives, indicating VOC content.
- 19. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
- 20. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 21. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 22. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 23. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
- 24. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 25. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
- 26. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
- 27. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
- 28. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For panel assembly and installation.

- 1. Include plans, elevations, sections, and mounting devices and details.
- 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
- 3. Include details at cutouts and penetrations for other work.
- 4. Include direction of fabric weave and pattern matching.

D. Samples for Initial Selection: For each type of fabric facing.

- 1. Include Samples of hardware and accessories involving color or finish selection.

E. Samples for Verification: For the following products:

- 1. Fabric: Full-width by approximately **[36-inch- (900-mm-)]<Insert dimension>** long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
- 2. Panel Edge: **12-inch- (300-mm-)** long Sample(s) showing each edge profile, corner, and finish.
- 3. Core Material: **12-inch- (300-mm-)** square Sample at corner.
- 4. Mounting Devices: Full-size Samples.
- 5. Assembled Panels: Approximately **36 by 36 inches (900 by 900 mm)**, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
 2. Items penetrating or covered by panels including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. <Insert item>.
 3. Show operation of hinged and sliding components covered by or adjacent to panels.
- B. Product Certificates: For each type of panel.
- C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of panel to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fabric: For each fabric, color, and pattern installed, provide length equal to [10]<Insert number> percent of amount installed, but no fewer than [10 sq. yd. (9 sq. m)]<Insert quantity>, full width of bolt.
 2. Mounting Devices: Full-size units equal to [5]<Insert number> percent of amount installed, but no fewer than [five]<Insert number> devices, including unopened adhesives.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
1. Build mockup of typical wall area [as shown on Drawings][48 inches (1200 mm) wide by full height]<Insert dimensions>.[Include intersection of wall and ceiling, corners, and

perimeters.]

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install panels until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install panels until **[a permanent level of lighting][a lighting level of not less than 50 fc (538 lx)]<Insert requirement>** is provided on surfaces to receive the panels.
- C. Air-Quality Limitations: Protect panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify panel locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace panels and components that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge.
 - b. Warping of core.
 2. Warranty Period: **[Two]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain fabric-wrapped wall panels[**and fabric-wrapped ceiling panels specified in Section 095446 "Fabric-Wrapped Ceiling Panels"**] from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 FABRIC-WRAPPED WALL PANELS

- A. Fabric-Wrapped Wall Panel : Manufacturer's standard panel construction consisting of facing material **[laminated to front face, edges, and back edge border of core][stretched over front face of edge-framed core and bonded or attached to edges and back of frame]<Insert description>**.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acoustical Panel Systems (APS, Inc.)]**
 - b. **[Acoustical Solutions]**
 - c. **[Armstrong Ceiling & Wall Solutions]**
 - d. **[Armstrong World Industries]**
 - e. **[AVL Systems, Inc]**
 - f. **[Benton Brothers Solutions, Inc.]**
 - g. **[Brejtfus Acoustical Interiors]**
 - h. **[Conwed]**
 - i. **[Decoustics; CertainTeed Architectural Products; a Saint Gobain company]**
 - j. **[Essi Acoustical Products]**
 - k. **[G&S Acoustics]**
 - l. **[Lamvin, Inc]**

- m. [MBI Products Company, Inc]
 - n. [Panel Solutions, Inc]
 - o. [Perdue Acoustics]
 - p. [Pinta Acoustic, Inc.]
 - q. [Sound Concepts]
 - r. [Sound Management Group LLC]
 - s. [Wenger Corporation]
 - t. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Acoustical Panel Systems (APS, Inc.)]
 - b. [Acoustical Solutions]
 - c. [Armstrong Ceiling & Wall Solutions]
 - d. [Armstrong World Industries]
 - e. [AVL Systems, Inc]
 - f. [Benton Brothers Solutions, Inc.]
 - g. [Brejtfus Acoustical Interiors]
 - h. [Conwed]
 - i. [Decoustics; CertainTeed Architectural Products; a Saint Gobain company]
 - j. [Essi Acoustical Products]
 - k. [G&S Acoustics]
 - l. [Lamvin, Inc]
 - m. [MBI Products Company, Inc]
 - n. [Panel Solutions, Inc]
 - o. [Perdue Acoustics]
 - p. [Pinta Acoustic, Inc.]
 - q. [Sound Concepts]
 - r. [Sound Management Group LLC]
 - s. [Wenger Corporation]
 - t. <Insert manufacturer's name>
3. Panel Shape: [Flat][As indicated on Drawings]<Insert shape>.
4. Mounting:
- a. Edge mounted with splines secured to substrate.
 - 1) Finish Color at Exposed Edges: [White][Black][Match color of facing material][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
 - b. Back mounted with manufacturer's standard [adhesive][adhesive tape strips][hook-and-loop strips][impaling clips][magnetic devices][metal clips or bar hangers], secured to substrate.
5. Core: [Manufacturer's standard][Glass-fiber board][Glass-fiber blanket][Mineral-fiber board][Cementitious-fiber board][Medium-density fiberboard][Particleboard]<Insert requirement>.[Provide wood or plywood nailing strips in core where indicated.]
- a. Core-Face Layer: Manufacturer's standard [tackable, impact-resistant, high-density board][impact-resistant, copolymer sheet][cork]<Insert requirement>.
6. Core Overlay: Polyester batting [1/2 inch (13 mm) thick][manufacturer's standard

- thickness]<Insert dimension>.**
7. Edge Construction: Manufacturer's standard [**chemically hardened core with no frame**][**extruded-aluminum or zinc-coated, rolled-steel frame**][**extruded PVC frame**][**wood frame, rabbeted, and splined with glued joints and machined corners**]<Insert requirement>.
 8. Edge Profile: [**Long edges kerfed and rabbeted to receive splines**][**Chamfered (beveled)**][**Eased (small radius)**][**Mitered (beveled to a point)**][**Radiused (bullnosed)**][**Square**][**Custom profile as indicated on Drawings**]<Insert profile>.
 9. Corner Detail in Elevation: [**Square**][**Round, radius as indicated on Drawings**][**Custom as indicated on Drawings**]<Insert description> with continuous edge profile indicated.
 10. Reveals between Panels: [**Recessed**][**Flush**][**Projecting**] reveals [**as selected by Architect from manufacturer's full range**][**as indicated on Drawings**]<Insert requirement>.
 11. Facing Material: [**Owner-furnished material**][**As indicated on Drawings**]<Insert drawing designation>.
 12. Nominal [**Core**][**Overall Panel**] Thickness: [**3/4 inch (19 mm)**][**1 inch (25 mm)**][**1-1/2 inches (38 mm)**][**2 inches (51 mm)**][**As indicated on Drawings**]<Insert dimension>.
 13. Panel Width: [**24 inches (610 mm)**][**30 inches (762 mm)**][**48 inches (1220 mm)**][**As indicated on Drawings**]<Insert dimension>.
 14. Panel Height: [**72 inches (1829 mm)**][**96 inches (2438 mm)**][**108 inches (2743 mm)**][**120 inches (3048 mm)**][**As indicated on Drawings**]<Insert dimension>.

2.4 MATERIALS

A. Sustainable Design Requirements:

1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
4. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - d. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
5. Composite Wood Products: Products shall be made without urea formaldehyde.
6. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
7. Regional Materials: Products shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site.
8. Regional Materials: Products shall be fabricated within **500 miles (800 km)** of Project site.
9. Regional Materials: Products shall be fabricated within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered within **100 miles (160 km)** of Project site.
10. Indigenous Materials: Products shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

11. Regional Materials: Products shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
12. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
13. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
14. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
15. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
16. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

B. Core Materials:[**Manufacturer's standard.**]

1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of [**6 to 7 lb/cu. ft. (96 to 112 kg/cu. m)**]**<Insert value>**, unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Glass-Fiber Blanket: ASTM C612, ASTM C553, or ASTM C665; of type standard with manufacturer; nominal density of [**3 to 4 lb/cu. ft. (48 to 64 kg/cu. m)**]**<Insert value>**; flexible[; **with tackable, thermally bonded, white glass-fiber mat facing;**] and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
3. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of [**13 lb/cu. ft. (208 kg/cu. m)**][**20 lb/cu. ft. (320 kg/cu. m)**].
4. Cementitious-Fiber Board: Density of not less than [**20 lb/cu. ft. (320 kg/cu. m)**]**<Insert value>**.
5. Medium-Density Fiberboard: Panels complying with ANSI A208.2, [**grade to suit performance requirements**][**Grade 130**]**<Insert grade>**.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84 or UL 723.
6. Particleboard: Panels complying with ANSI A208.1, [**grade to suit performance requirements**][**Grade M-2**]**<Insert grade>**.
 - a. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E84 or UL 723.
7. Tackable, Impact-Resistant, High-Density Board for Face Layer: **1/8-inch- (3.2-mm-)** thick layer of compressed, molded glass-fiber board with a nominal density of **16 to 18 lb/cu. ft. (256 to 288 kg/cu. m)** laminated to face of core.
8. Impact-Resistant, Copolymer Sheet for Face Layer: **1/16- to 1/8-inch- (1.6- to 3.2-mm-)** thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.
9. Cork for Face Layer: Single **1/8-inch- (3.2-mm-)** thick seamless sheet of compressed fine-grain cork, bulletin board quality.

10. Core Overlay: Flame-retardant, compressible, fiberfill, polyester batting.
11. Wood and Plywood: Manufacturer's standard plywood or clear, vertical grain, straight, kiln-dried hardwood.
 - a. Fire-retardant treated by pressure process with a flame-spread index of 25 or less when tested according to ASTM E84 or UL 723, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than **10.5 feet (3.2 m)** beyond the centerline of the burners at any time during the test.
 - 1) Treated material are to have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity.
 - 2) Kiln-dry material after treatment to 19 percent for lumber and 15 percent or less for plywood.
- C. Facing Material : Fabric from same dye lot; color and pattern **[as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>**.
 1. Manufacturer: **<Insert manufacturer's name>**.
 2. Product Line/Pattern: **<Insert product name or designation>**.
 3. Pattern Repeat: **<Insert requirement>**.
 4. Style Number: **<Insert number>**.
 5. Color: **<Insert name or number, or both>**.
 6. Fiber Content: **[100]<Insert number> percent [woven polyester][nonwoven polyester][polyolefin][vinyl]<Insert fiber requirement>**.
 7. Width: **[54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>**.
 8. Source: **<Insert fabric-vendor's name>**.
 9. Applied Treatments: **[Stain resistance][flame-retardant][acrylic backing, single coat][acrylic backing, double coat][latex backing][foam backing][and][knit backing]<Insert treatment>**.
 10. Lining Material: **[Manufacturer's standard fabric for each use indicated]<Insert material designation>**.
- D. Lining Material **<Insert material designation>**: Fabric **[as indicated by manufacturer's designations][matching Architect's samples][as selected by Architect from manufacturer's full range][as indicated on Drawings]<Insert requirement>**.
 1. Manufacturer: **<Insert manufacturer's name>**.
 2. Product Line: **<Insert product name or designation>**.
 3. Style Number: **<Insert number>**.
 4. Color: **[White]<Insert name or number, or both>**.
 5. Fiber Content: **<Insert content by percentage and fiber type>**.
 6. Width: **[54 inches (1371 mm)][66 inches (1676 mm)]<Insert dimension>**.
 7. Source: **<Insert fabric-vendor's name>**.
 8. Applied Treatments: **[Stain resistance][and][flame retardant]<Insert treatment>**.
- E. Mounting Devices: Concealed on back of panel, recommended by manufacturer to support weight of panel, and as follows:
 1. Splines: Manufacturer's standard concealed metal or plastic splines that engage the kerfed edges of the panel, with other moldings and trim for interior corners, exterior corners, and exposed edges, with factory-applied finish on exposed items.
 2. Adhesives shall have a VOC content of **[70]<Insert value> g/L** or less.
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
7. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
8. Adhesive Tape Strips: **[Manufacturer's standard 1/16-inch- (1.6-mm-) thick, double-sided foam tape]<Insert requirement>**.
9. Hook-and-Loop Strips: **[Manufacturer's standard]<Insert requirement>**.
10. Impaling Clips: **[Manufacturer's standard]<Insert requirement>**.
11. Magnetic Strip or Devices: **[Manufacturer's standard]<Insert requirement>**.
12. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of panel and the other part to substrate, designed to permit unit removal.

2.5 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Edge Hardening: For **[glass-fiber board][and][mineral-fiber board]** cores, chemically harden core edges and areas of core where mounting devices are attached.
- C. Core-Face Layer **[and Core Overlay]**: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- D. Facing Material **[and Lining Material]**: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 1. Square Corners: Tailor corners. **[Heat-seal vinyl fabric seams at corners.]**
 2. Radius and Other Nonsquare Corners: Attach material so there are no seams or gathering of material.
 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.
- E. Dimensional Tolerances of Finished Panels: Plus or minus **1/16 inch (1.6 mm)** for the following:
 1. Thickness.
 2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.
 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated panels, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting panel performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panels in locations indicated. Unless otherwise indicated, install panels with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.
- C. Align fabric pattern and grain **[with adjacent panels][as indicated on Drawings]**.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus **[1/16 inch (1.6 mm)]<Insert dimension> in 48 inches (1200 mm)**, noncumulative.
- B. Variation of Joint Width: Not more than **[1/16 inch (1.6 mm)][1/32 inch (0.79 mm)]<Insert dimension>** wide from **[hairline][reveal line]** in **48 inches (1200 mm)**, noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 70 00 00B



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Task	Specification	Specification Description
09 70 00 00	09 72 00 00	Wall Coverings
09 70 00 00	04 41 00 00	Stone Wall Facing



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SECTION 09 72 00 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl wall covering.
 - 2. Thermoplastic-polyolefin wall covering.
 - 3. Woven glass-fiber wall covering.
 - 4. Textile wall covering.
 - 5. Heavy-duty, synthetic-textile wall covering.
 - 6. Wood-veneer wall covering.
 - 7. Wallpaper.
- B. Owner-Furnished Materials: **<Insert requirements>**.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. **<Insert participant requirements>**.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.

3. Product Data: For adhesives, indicating VOC content.
 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 5. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
 6. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
 7. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
 8. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Show location and extent of each wall-covering type. Indicate **[pattern placement][veneer matching]** seams and termination points.
- D. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by **[36 inches (914 mm)]<Insert dimension>** long in size.
1. Wall-Covering Sample: From same production run to be used for the Work, with specified **[treatments][paint]** applied.
 - a. Show complete pattern repeat.
 - b. Mark top and face of fabric.
 2. Wood-Veneer Wall-Covering Sample: From same flitch to be used for the Work, with specified finish applied.
- E. Samples for Initial Selection: For each type of wall covering.
- F. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by **[36 inches (914 mm)]<Insert dimension>** long in size.
1. Wall-Covering Sample: From same production run to be used for the Work, with specified **[treatments][paint]** applied.
 - a. Show complete pattern repeat.
 - b. Mark top and face of fabric.
 2. Wood-Veneer Wall-Covering Sample: From same flitch to be used for the Work, with specified finish applied.
- G. Product Schedule: For wall coverings. **[Use same designations indicated on Drawings.]**
- 1.7 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.
- 1.8 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to [5]<Insert number> percent of amount installed.

1.10 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
 - 1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS
2.1 PERFORMANCE REQUIREMENTS

- A. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- D. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **[25]<Insert value>** or less.
 - b. Smoke-Developed Index: **[50][450]<Insert value>** or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release when tested in accordance with **[NFPA 265][NFPA 286]**.

2.2 VINYL WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Arc-Com Fabrics, Inc.]**
 - 2. **[Avery Dennison]**
 - 3. **[Designtex; Design Tex Group Inc. (The)]**
 - 4. **[F. Schumacher & Co.]**
 - 5. **[Fidelity Wallcoverings Inc.]**
 - 6. **[Innovations USA]**
 - 7. **[Knoll, Inc.]**
 - 8. **[Len-Tex Corporation]**
 - 9. **[Maharam Fabric Corporation; Herman Miller, Inc.]**
 - 10. **[MDC Interior Solutions]**
 - 11. **[Roysons Corporation]**
 - 12. **[US Vinyl Manufacturing Corporation]**
 - 13. **[Versa Wallcovering]**

14. [Vescom America Inc.]
 15. [Wolf-Gordon Inc.]
 16. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Arc-Com Fabrics, Inc.]
 2. [Avery Dennison]
 3. [Designtex; Design Tex Group Inc. (The)]
 4. [F. Schumacher & Co.]
 5. [Fidelity Wallcoverings Inc.]
 6. [Innovations USA]
 7. [Knoll, Inc.]
 8. [Len-Tex Corporation]
 9. [Maharam Fabric Corporation; Herman Miller, Inc.]
 10. [MDC Interior Solutions]
 11. [Roysons Corporation]
 12. [US Vinyl Manufacturing Corporation]
 13. [Versa Wallcovering]
 14. [Vescom America Inc.]
 15. [Wolf-Gordon Inc.]
 16. <Insert manufacturer's name>
- C. Description: Provide vinyl products in rolls from same production run and complying with the following:
1. [FS CCC-W-408D][and][Wallcovering Association's W-101] for [Type I, Light][Type II, Medium][Type III, Heavy] Duty.
 2. ASTM F793/F793M for [peelable][strippable] wall coverings.
 - a. Category: [I, Decorative Only][II, Decorative with Medium Serviceability][III, Decorative with High Serviceability][IV, Type I, Commercial Serviceability (Vinyl Coated)][V, Type II, Commercial Serviceability (Vinyl Coated)][VI, Type III, Commercial Serviceability (Vinyl Coated)].
- D. Total Weight: <Insert weight>, excluding coatings.
- E. Width: [27 inches (686 mm)][54 inches (1372 mm)]<Insert dimension>.
- F. Backing: [Scrim][Osaburg][Drill][Nonwoven] fabric.
1. Fiber Content: [Cotton][Polyester][Polycotton][Polyester cellulose]<Insert requirements>.
- G. Repeat: [Random]<Insert requirements>.
- H. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
- I. Features:
1. Stain-Resistant Coating: <Insert requirements>.
 2. Antimicrobial.
 3. Water-based inks.
 4. Phthalate free.
 5. Heavy-metals free.
 6. Halogenated-fire-retardant free.
 7. Microvented.

8. <Insert feature>.

- J. Colors, Textures, and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.3 THERMOPLASTIC-POLYOLEFIN WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Carnegie Fabrics, LLC.]**
2. **[Knoll, Inc.]**
3. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Carnegie Fabrics, LLC.]**
2. **[Knoll, Inc.]**
3. **<Insert manufacturer's name>**

- C. Description: Provide products complying with Wallcoverings Association's W-101; free of PVC, chlorine, plasticizers, formaldehyde, heavy metals, and halogenated fire retardants; with water-based inks and coatings; with antimicrobial additives; and in rolls from same production run.

1. Type: **[Type I, Light][Type II, Medium][Type III, Heavy]** Duty.

- D. Total Weight: **<Insert weight>**, excluding coatings.

- E. Width: **[52 inches (1321 mm)]<Insert dimension>**.

- F. Backing: **[Woven][Nonwoven]** fabric.

1. Fiber Content: **[Polyester cellulose]<Insert requirements>**.

- G. Repeat: **[Random]<Insert requirements>**.

- H. Features:

1. Microvented.
2. **<Insert feature>**.

- I. Colors, Textures, and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.4 WOVEN GLASS-FIBER WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [Johns Manville; a Berkshire Hathaway company]
 2. [Newtex Industries, Inc.]
 3. [Roos International LTD. USA]
 4. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Johns Manville; a Berkshire Hathaway company]
 2. [Newtex Industries, Inc.]
 3. [Roos International LTD. USA]
 4. <Insert manufacturer's name>
- C. Description: Provide woven glass-fiber wall covering with paintable exposed surface in rolls from same production run.
- D. Total Weight: <Insert weight>.
- E. Width: [39 inches (991 m)]<Insert dimension>.
- F. Textures and Patterns: [Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>.

2.5 TEXTILE WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Carnegie Fabrics, LLC.]
 2. [DesignTex; Design Tex Group Inc. (The)]
 3. [F. Schumacher & Co.]
 4. [Hytex Industries Inc.]
 5. [Innovations USA]
 6. [Knoll, Inc.]
 7. [Maharam Fabric Corporation; Herman Miller, Inc.]
 8. [MDC Interior Solutions]
 9. [Vescom America Inc.]
 10. [Wolf-Gordon Inc.]
 11. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Carnegie Fabrics, LLC.]
 2. [DesignTex; Design Tex Group Inc. (The)]
 3. [F. Schumacher & Co.]
 4. [Hytex Industries Inc.]
 5. [Innovations USA]
 6. [Knoll, Inc.]
 7. [Maharam Fabric Corporation; Herman Miller, Inc.]
 8. [MDC Interior Solutions]
 9. [Vescom America Inc.]
 10. [Wolf-Gordon Inc.]
 11. <Insert manufacturer's name>

- C. Description: Provide wall coverings in rolls from same production run and that comply with the following:
1. ASTM F793/F793M: **[Category I, Decorative Only][Category II, Decorative with Medium Serviceability][Category III, Decorative with High Serviceability][Category IV, Type I, Commercial Serviceability (Vinyl Coated)][Category V, Type II, Commercial Serviceability (Vinyl Coated)][Category VI, Type III, Commercial Serviceability (Vinyl Coated)]**.
 2. Wallcoverings Association's W-101: **[Type I, Light Duty (Polyolefin Coated)][Type II, Medium Duty (Polyolefin Coated)][Type III, Heavy Duty (Polyolefin Coated)]**.
- D. Test Responses:
1. Colorfastness to Wet and Dry Crocking: **[Complies with AATCC 8, Grade 3, minimum]<Insert requirements>**.
 2. Colorfastness to Light: **[Complies with AATCC 16.2 Test Option 1 or AATCC 16.3 Test Option 3, Class L4, minimum, at 40 hours]<Insert requirements>**.
 3. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
- E. Total Weight: **<Insert weight>**, excluding coatings.
- F. Width: **<Insert width>**.
- G. Repeat: **[Random]<Insert requirements>**.
- H. Applied Backing Material: **[Acrylic][Paper]<Insert requirements>**.
- I. Features:
1. Stain-Resistant Coating: **<Insert requirements>**.
 2. Tackable.
 3. **[Peelable][Strippable]**.
 4. Antimicrobial.
 5. Water-based inks.
 6. PVC free.
 7. Phthalate free.
 8. Heavy-metals free.
 9. Halogenated-fire-retardant free.
 10. **<Insert feature>**.
- J. Colors, Textures, and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.6 HEAVY-DUTY, SYNTHETIC-TEXTILE WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Carnegie Fabrics, LLC.]**
 2. **[Designtex; Design Tex Group Inc. (The)]**
 3. **[Hytex Industries Inc.]**
 4. **[Innovations USA]**
 5. **[Knoll, Inc.]**
 6. **[Maharam Fabric Corporation; Herman Miller, Inc.]**
 7. **[MDC Interior Solutions]**

8. **[Vescom America Inc.]**
 9. **[Wolf-Gordon Inc.]**
 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Carnegie Fabrics, LLC.]**
 2. **[Designtex; Design Tex Group Inc. (The)]**
 3. **[Hytex Industries Inc.]**
 4. **[Innovations USA]**
 5. **[Knoll, Inc.]**
 6. **[Maharam Fabric Corporation; Herman Miller, Inc.]**
 7. **[MDC Interior Solutions]**
 8. **[Vescom America Inc.]**
 9. **[Wolf-Gordon Inc.]**
 10. **<Insert manufacturer's name>**
- C. Description: Provide wall coverings in rolls from same production run and that comply with the following:
1. ASTM F793/F793M: **[Category IV, Type I, Commercial Serviceability (Vinyl Coated)][Category V, Type II, Commercial Serviceability (Vinyl Coated)][Category VI, Type III, Commercial Serviceability (Vinyl Coated)]**.
 2. Wallcoverings Association's W-101: **[Type I, Light Duty (Polyolefin Coated)][Type II, Medium Duty (Polyolefin Coated)][Type III, Heavy Duty (Polyolefin Coated)]**.
- D. Test Responses:
1. Colorfastness to Wet and Dry Crocking: **[Complies with AATCC 8, Class 3, minimum]<Insert requirements>**.
 2. Colorfastness to Light: **[Complies with AATCC 16.2 Test Option 1 or AATCC 16.3 Test Option 3, Class L4, minimum, at 40 hours]<Insert requirements>**.
 3. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
- E. Total Weight: **<Insert weight>**.
- F. Width: **[54 inches (1372 mm)][60 inches (1524 mm)]<Insert dimension>**.
- G. Applied Backing Material: **[Acrylic]<Insert requirements>**.
- H. Features:
1. Stain-Resistant Coating: **<Insert requirements>**.
 2. Tackable.
 3. Antimicrobial.
 4. Water-based inks.
 5. PVC free.
 6. Phthalate free.
 7. Heavy-metals free.
 8. Halogenated-fire-retardant free.
 9. Microvented.
 10. **<Insert feature>**.
- I. Colors, Textures, and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.7 WOOD-VENEER WALL COVERING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[D. L. Couch]**
 2. **[Flexible Materials Incorporated]**
 3. **[Jacaranda Inc.]**
 4. **[Misumaru USA Corporation]**
 5. **[Roos International LTD. USA]**
 6. **[SR Wood, Inc.]**
 7. **[Wolf-Gordon Inc.]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[D. L. Couch]**
 2. **[Flexible Materials Incorporated]**
 3. **[Jacaranda Inc.]**
 4. **[Misumaru USA Corporation]**
 5. **[Roos International LTD. USA]**
 6. **[SR Wood, Inc.]**
 7. **[Wolf-Gordon Inc.]**
 8. **<Insert manufacturer's name>**
- C. Description: Provide wood-veneer wall covering in rolls from same production run.
- D. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-00 and FSC STD-40-004.
- E. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
- F. Certified Wood: Wood products shall be labeled according to the AFPA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- G. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "Technical Barriers to Trade."
- H. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AFPA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- I. Sheet Size: **[24 by 96 inches (610 by 2438 mm)][48 by 96 inches (1219 by 2438 mm)][48 by 120 inches (1219 by 3048 mm)]<Insert dimensions>**.
- J. Veneer Construction: **[Single-ply veneer][Two veneer plies assembled perpendicular to one another]<Insert requirements>**.
- K. Wood Species: **[Red oak][Maple][Cherry]<Insert requirements>**.

- L. Cut and Figure: **<Insert requirements>**.
- M. Veneer Match: **[Book][Slip][Random]<Insert requirements>**.
- N. Sheet Match: **[Running][Balance][Center][Sequence, as indicated on Drawings][Blueprint, as indicated on Drawings]**.
- O. Applied Backing Material: **[Fabric]<Insert requirements>**.
- P. Finish: **[Factory][Field]** applied using wall-covering manufacturer's standard **[stain and polyurethane]<Insert requirements>** system.
 - 1. Colors: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.8 WALLPAPER

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[F. Schumacher & Co.]**
 - 2. **[Roysons Corporation]**
 - 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[F. Schumacher & Co.]**
 - 2. **[Roysons Corporation]**
 - 3. **<Insert manufacturer's name>**
- C. Description: Provide wallpaper in rolls from same production run and that complies with ASTM F793/F793M.
 - 1. Category: **[I, Decorative Only][II, Decorative with Medium Serviceability][III, Decorative with High Serviceability][I, Decorative Only (Vinyl Coated)][II, Decorative with Medium Serviceability (Vinyl Coated)][III, Decorative with High Serviceability (Vinyl Coated)]**.
- D. Total Weight: **<Insert weight>**.
- E. Width: **[20-1/2 inches (521 mm)][28 inches (711 mm)]<Insert dimension>**.
- F. Repeat: **[Random]<Insert requirements>**.
- G. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
- H. Features:
 - 1. **[Peelable][Strippable]**.
 - 2. **<Insert feature>**.
- I. Colors, Textures, and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.9 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining[, **strippable**] adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
1. Adhesives shall have a VOC content of [50]<Insert value> g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- B. Primer/Sealer: Mildew resistant, complying with [requirements in Section 099123 "Interior Painting"]<Insert requirements> and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.
- C. Metal Primer: Interior ferrous metal primer complying with [requirements in Section 099123 "Interior Painting"]<Insert requirements> and recommended in writing by primer and wall-covering manufacturers for intended substrate.
- D. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended in writing by wall-covering manufacturer.
1. Adhesives shall have a VOC content of [50]<Insert value> g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- E. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, and mildew.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow plaster to cure for at least 90 days. Neutralize areas of high alkalinity. Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Metals: If not factory primed, clean and apply metal primer as recommended in writing by metal-primer manufacturer and wall-covering manufacturer.
 - 4. Gypsum Board: Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 5. Painted Surfaces:
 - a. Check for pigment bleeding. Apply primer/sealer to areas susceptible to pigment bleeding as recommended in writing by primer/sealer manufacturer.
 - b. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION OF WALL LINER

- A. Install wall liner, without gaps or overlaps. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.4 INSTALLATION OF WALL COVERING

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
 - 1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Match pattern **[72 inches (1828 mm)]**<Insert dimension> above the finish floor.
- F. Install seams vertical and plumb at least **6 inches (152 mm)** from outside corners and **[3 inches (76 mm)][6 inches (152 mm)]** from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.5 FIELD FINISHING OF WOOD-VENEER WALL COVERINGS

- A. Apply specified finish system according to coating manufacturer's written instructions to produce finish that is consistent in color and gloss and matches approved Samples.
- B. Apply no fewer than **[two][three]** finish coats.

3.6 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00 00



Task	Specification	Specification Description
09 72 00 00	04 41 00 00	Stone Wall Facing
09 72 00 00	09 70 00 00	Stone Trim
09 72 00 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 72 00 00	09 70 00 00b	Fabric-Wrapped Panels
09 72 13 00	09 72 00 00	Wall Coverings
09 72 13 00	04 41 00 00	Stone Wall Facing
09 72 13 00	09 70 00 00	Stone Trim
09 72 13 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 72 13 00	09 70 00 00b	Fabric-Wrapped Panels
09 72 16 00	09 72 00 00	Wall Coverings
09 72 16 00	04 41 00 00	Stone Wall Facing
09 72 16 00	09 70 00 00	Stone Trim
09 72 16 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 72 16 00	09 70 00 00b	Fabric-Wrapped Panels
09 72 16 13	09 72 00 00	Wall Coverings
09 72 16 13	04 41 00 00	Stone Wall Facing
09 72 16 13	09 70 00 00	Stone Trim
09 72 16 13	09 70 00 00a	Stretched-Fabric Wall Systems
09 72 16 13	09 70 00 00b	Fabric-Wrapped Panels
09 72 23 00	09 72 00 00	Wall Coverings
09 72 23 00	04 41 00 00	Stone Wall Facing
09 72 23 00	09 70 00 00	Stone Trim
09 72 23 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 72 23 00	09 70 00 00b	Fabric-Wrapped Panels
09 73 00 00	09 68 16 00	Sheet Carpeting
09 73 00 00	09 72 00 00	Wall Coverings
09 73 00 00	04 41 00 00	Stone Wall Facing
09 73 00 00	09 70 00 00	Stone Trim
09 73 00 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 73 00 00	09 70 00 00b	Fabric-Wrapped Panels
09 74 00 00	09 72 00 00	Wall Coverings
09 74 00 00	04 41 00 00	Stone Wall Facing
09 74 00 00	09 70 00 00	Stone Trim
09 74 00 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 74 00 00	09 70 00 00b	Fabric-Wrapped Panels
09 74 16 00	09 72 00 00	Wall Coverings
09 74 16 00	04 41 00 00	Stone Wall Facing
09 74 16 00	09 70 00 00	Stone Trim
09 74 16 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 74 16 00	09 70 00 00b	Fabric-Wrapped Panels
09 77 00 00	09 72 00 00	Wall Coverings
09 77 00 00	04 41 00 00	Stone Wall Facing
09 77 00 00	09 70 00 00	Stone Trim
09 77 00 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 77 00 00	09 70 00 00b	Fabric-Wrapped Panels
09 78 00 00	09 72 00 00	Wall Coverings
09 78 00 00	04 41 00 00	Stone Wall Facing
09 78 00 00	09 70 00 00	Stone Trim
09 78 00 00	09 70 00 00a	Stretched-Fabric Wall Systems
09 78 00 00	09 70 00 00b	Fabric-Wrapped Panels
09 84 13 00	09 29 00 00	Gypsum Board



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SECTION 09 91 13 00 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation of exterior substrates and application of the following:
1. Primers.
 2. Water-based finish coatings.
 3. Solvent-based finish coatings.
 4. Floor sealers and paints.
- B. Related Requirements:
1. **[Section 051200 "Structural Steel Framing"] [Section 051213 "Architecturally Exposed Structural Steel Framing"]** for shop priming structural steel substrates.
 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
 4. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 5. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
 6. Section 055213 "Pipe and Tube Railings" for shop **[priming] [painting]** pipe and tube railings.
 7. **[Section 055313 "Bar Gratings"] [Section 055316 "Plank Gratings"] [Section 055319 "Expanded Metal Gratings"]** for shop priming metal gratings.
 8. Section 099123 "Interior Painting."
 9. Section 099300 "Staining and Transparent Finishing" for surface preparation and application of wood stains and transparent finishes on exterior wood substrates.
 10. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include preparation requirements and application instructions.
 2. Indicate VOC content.
- B. Samples: For each type of topcoat product.
- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat. Submit **[actual paint drawdowns as specified below] [paint manufacturer's standard printed cards]** for verification Samples.
1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in applicable exterior painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.

F. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for VOC content of paints.>

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match paint products applied and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint Products: [5] <Insert number> percent, but not less than [1 gal. (3.8 L)] <Insert value> of each material and color applied.

1.4 MOCKUPS

A. Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, demonstrate aesthetic effects, and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each paint product from single source from single manufacturer.

2.2 EXTERIOR PAINTS, GENERAL

- A. Exterior Paints: Subject to compliance with requirements, **[provide product] [provide one of the products] [available products that may be incorporated into the Work include but are not limited to products]** listed in product types below and applicable exterior painting schedule articles for the paint category indicated.
- B. Material Compatibility:
 - 1. Materials for use within each paint system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.
- C. <Double click to insert sustainable design text for VOC content of paints.>
- D. Colors: **[As selected by Architect from manufacturer's full range] [Match Architect's samples] [As indicated in a color schedule on Drawings] <Insert requirements>**.
 - 1. **[10] [20] [30] <Insert number>** percent of surface area will be painted with deep tones.

2.3 PRIMERS

- A. Alkali-Resistant, Water-Based Primer: Water-based primer formulated for use on alkaline substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Exterior Wood Preservative: Solvent-based, zinc or copper naphthenate, penetrating antifungal treatment for exterior wood.
- C. Exterior, Latex Wood Primer: White, waterborne-emulsion primer formulated for resistance to extractive bleeding, mold, and microbials; for hiding stains; and for use on exterior wood substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- D. Exterior, Alkyd/Oil Wood Primer: Solvent-based primer formulated for resistance to extractive bleeding, sag, mold, and microbials; for hiding stains; and for use on exterior wood substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

- E. Latex Block Filler: Water-based, pigmented, high-solids, emulsion coating formulated to bridge and fill porous surfaces of CMU substrates in preparation for specified subsequent coatings.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. Water-Based Bonding Primer: Water-based-emulsion primer formulated to promote adhesion of subsequent specified coatings.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Solvent-Based Bonding Primer: Solvent-based primer formulated to seal substrates and promote adhesion of specified subsequent coatings.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- H. Water-Based, Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer; formulated for resistance to flash rusting when applied to cleaned, ferrous metal substrates subject to mildly corrosive environments.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- I. Zinc-Rich, Inorganic Primer: Corrosion-resistant, inorganic-based, zinc-rich primer formulated for use on prepared ferrous metal substrates subject to severe industrial or marine environments.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- J. Surface-Tolerant Metal Primer: Corrosion-resistant, solvent-based metal primer formulated for use on structural steel and metal fabrications that have been minimally prepared.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- K. Quick-Drying, Alkyd Metal Primer: Corrosion-resistant, solvent-based, modified-alkyd primer; lead and chromate free; formulated for quick-drying capabilities and for use on cleaned, ferrous metal substrates.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- L. Alkyd Metal Primer: Corrosion-resistant, solvent-based, alkyd primer formulated for use on prepared ferrous metal substrates subject to industrial and light marine environments.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- M. Water-Based, Galvanized-Metal Primer: Corrosion-resistant, pigmented, acrylic primer; formulated for use on cleaned/etched galvanized metal substrates to prepare it for subsequent water-based coatings.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- N. Epoxy, Anticorrosive Primer: Solvent-based, two-component, epoxy, anti-corrosive primer; formulated for use on ferrous and galvanized metal substrates.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- O. Vinyl Wash Primer: Two-component, vinyl butyral/phosphoric acid-wash primer formulated for use over cleaned ferrous metal substrates and zinc-rich primers as a tie coat for subsequent corrosion-resistant primers or finish coatings.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

- P. Quick-Drying Aluminum Primer: Corrosion-resistant, solvent-based, alkyd or modified-alkyd primer formulated for quick-drying capabilities and for use on prepared aluminum substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

- Q. Wood-Knot Sealer: White shellac or other sealer recommended in writing by manufacturer for this purpose.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.4 WATER-BASED FINISH COATINGS

- A. Exterior Latex Paint: Water-based, pigmented coating; formulated for alkali, mold, microbial, and water resistance and for use on exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss and Sheen: Manufacturer's standard [**flat**] [**low sheen**] [**semigloss**] [**gloss**].

- B. Exterior, High-Build Latex Paint: Water-based, high-build, pigmented, emulsion coating; is formulated for abrasion, mold, microbial, and wind-driven rain resistance and for use on exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss and Sheen Level: Manufacturer's standard.

- C. Textured Latex Coating: Water-based, pigmented, self-priming coating that contains sand or other hard aggregate for selected texture and is formulated for use on concrete and masonry substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss and Sheen Level: Manufacturer's standard [**flat**] [**nonflat**].

3. Texture: [**Manufacturer's standard**] [**Fine**] [**Medium**] [**Coarse**].

- D. Exterior, Water-Based, Light Industrial Coating: Corrosion-resistant, water-based, pigmented, emulsion coating formulated for resistance to water, alkalis, moderate abrasion, and mild chemical exposure and for use on exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss and Sheen Level: Manufacturer's standard [**low-sheen**] [**semigloss**] [**gloss**].

- E. Exterior, Water-Based Alkyd Paint: Water-based, pigmented, low-VOC alkyd paint formulated for flash rust and water resistance and for use on exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss and Sheen Level: Manufacturer's standard [**low sheen**] [**semigloss**] [**gloss**].

- F. Exterior, High-Performance Architectural Latex: Water-based, pigmented, low VOC, emulsion coating formulated for use on exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss Level: Manufacturer's standard [**low sheen**] [**semigloss**].

2.5 SOLVENT-BASED FINISH COATINGS

- A. Exterior Alkyd Paint: Solvent-based, pigmented, alkyd coating formulated for mold, microbial, and water resistance and for use on exterior substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Gloss and Sheen Level: Manufacturer's standard **[flat] [semigloss] [gloss]**.
- B. Quick-Drying Alkyd Paint: Solvent-based, alkyd or modified-alkyd coating formulated for quick-drying capabilities and for use on exterior substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Gloss Level: Manufacturer's standard **[semigloss] [gloss]**.
- C. Aluminum Paint: Aliphatic, solvent-based coating consisting of varnish or alkyd binder combined with aluminum pigment that is formulated for use as a stain-blocking coating and sealer, is able to be recoated with conventional alkyd and latex paints, and for use on wood, metal, bituminous-coated, and prepared masonry substrates.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.6 FLOOR SEALERS AND PAINTS

- A. Concrete Stain: Penetrating semitransparent stain specifically manufactured for interior and exterior concrete horizontal and vertical surfaces.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Latex Floor Enamel: Water-based, pigmented coating formulated to hide stains, for alkali and incidental water resistance, and for use on concrete and primed-wood substrates subject to low to medium foot traffic.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Gloss and Sheen Level: Manufacturer's standard **[low gloss] [gloss]**.
 - 3. Slip-Resistant Aggregate: Manufacturer's standard.
- C. Latex Deck Coating: Water-based, high-solids, acrylic-emulsion coating; formulated for use on exterior substrates subject to low to medium foot traffic.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Gloss Level: Manufacturer's standard.
 - 3. Surface Texture: **[Smooth] [Slip resistant]**.
- D. Alkyd Floor Enamel: Solvent-based, pigmented coating; self-priming where applied to bare wood; formulated to hide stains, for durability, for microbial and abrasion resistance, and for exterior substrates subject to low to medium foot traffic.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Gloss Level: Manufacturer's standard **[low gloss] [gloss]**.
 - 3. Slip-Resistant Aggregate: Manufacturer's standard additive.
- E. Water-Based, Concrete-Floor Sealer: Clear, water-based, acrylic-copolymer-emulsion sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- F. Solvent-Based, Concrete-Floor Sealer: Clear, acrylic, solvent-based sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic substrates.
 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Cementitious Composition Board: 12 percent.
 3. Masonry (Clay and CMU): 12 percent.
 4. Wood: 15 percent.
 5. Portland Cement Plaster (Stucco): 12 percent. Verify that plaster is fully cured.
- C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

- F. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by paint manufacturer[.][**but not less than the following:**]
1. SSPC-SP 2.
 2. SSPC-SP 3.
 3. SSPC-SP 7/NACE No. 4.
 4. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed substrates.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 2. Sand surfaces that will be exposed to view and remove sanding dust.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Canvas and Cotton Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- L. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION OF EXTERIOR PAINT PRODUCTS

- A. Apply paints in accordance with manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint **[both sides]** **[exterior side]** and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in applicable exterior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting, Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards[**and switch gear**].
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. **<Insert requirements>**.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.
 - 3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
 - 4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE, CONCRETE SUBSTRATES

A. Vertical (Nontraffic) Surfaces:

1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Alkali-resistant, water-based primer] [Matching topcoat]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
2. Latex over Latex Aggregate System: **<Insert drawing designation>**
 - a. Prime Coat: Textured latex coating, flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
3. Latex Aggregate System: **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured latex coating, **[flat] [nonflat]**.
4. High-Build Latex System: **<Insert drawing designation>**. Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, high-build latex paint.
5. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen] [semigloss] [gloss]**.
6. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Alkali-resistant, water-based primer] [As recommended in writing by topcoat manufacturer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.
7. High Performance Architectural Latex over Latex Aggregate System: **<Insert drawing designation>**
 - a. Prime Coat: Textured coating, latex, flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.

B. Horizontal (Traffic) Surfaces:

1. Latex Floor Enamel System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Latex floor enamel, [**low gloss**] [**gloss**].
- 2. Latex Deck Coating System: **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex deck coating.
- 3. Alkyd Floor Enamel System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Alkyd floor enamel, [**low gloss**] [**gloss**].
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- 4. Solvent-Based Concrete Floor Sealer System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Solvent-based, concrete-floor sealer.
- 5. Water-Based Concrete Floor Sealer System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Water-based, concrete-floor sealer.
- 6. Latex Zone/Traffic-Marking Paint System: **<Insert drawing designation>**
 - a. Traffic-marking paint, latex.
- 7. Alkyd Zone/Traffic-Marking Paint System: **<Insert drawing designation>**
 - a. Traffic-marking paint, solvent-based.

3.7 EXTERIOR PAINTING SCHEDULE, CEMENTITIOUS SUBSTRATES

- A. Cementitious Composition Board Substrates: [**Siding**] [**Trim**] [**Panels**] **<Insert requirements>**.
 - 1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [**flat**] [**low sheen**] [**semigloss**] [**gloss**].
 - 2. Latex over Alkyd Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [**flat**] [**low sheen**] [**semigloss**] [**gloss**].
 - 3. Latex Aggregate System: **<Insert drawing designation>**

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, textured coating, latex **[flat]** **[nonflat]**.
- 4. High-Build Latex System: **<Insert drawing designation>**. Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, high-build latex paint.
- 5. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen]** **[semigloss]** **[gloss]**.
- 6. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat]** **[semigloss]** **[gloss]**.
- 7. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Alkali-resistant, water-based primer]** **[As recommended in writing by topcoat manufacturer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen]** **[semigloss]**.
- B. Portland Cement Plaster (Stucco) Substrates:
 - 1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Matching topcoat]** **[Alkali-resistant, water-based primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat]** **[low sheen]** **[semigloss]** **[gloss]**.
 - 2. High-Build Latex System: **<Insert drawing designation>**. Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, high-build latex paint.
 - 3. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen]** **[semigloss]** **[gloss]**.
 - 4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd enamel, [low sheen] [semigloss] [gloss].
- 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: [Alkali-resistant, water-based primer] [As recommended in writing by topcoat manufacturer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].

3.8 EXTERIOR PAINTING SCHEDULE, MASONRY SUBSTRATES

A. Clay Masonry Substrates:

- 1. Latex System: <Insert drawing designation>
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
- 2. Latex Aggregate System: <Insert drawing designation>
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured latex coating, [flat] [nonflat].
- 3. High-Build Latex System: <Insert drawing designation>. Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, high-build latex paint.
- 4. Water-Based, Light Industrial Coating System: <Insert drawing designation>
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
- 5. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
- 6. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].

B. CMU Substrates:

- 1. Latex System: <Insert drawing designation>

- a. Prime Coat: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat]** **[low sheen]** **[semigloss]** **[gloss]**.
2. Latex over Alkali-Resistant Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat]** **[low sheen]** **[semigloss]** **[gloss]**.
3. Latex Aggregate System: **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured latex coating, **[flat]** **[nonflat]**.
4. High-Build Latex System: **<Insert drawing designation>**. Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Exterior, high-build latex paint.
5. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen]** **[semigloss]** **[gloss]**.
6. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen]** **[semigloss]** **[gloss]**.
7. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Alkali-resistant, water-based primer]** **[Latex block filler]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen]** **[semigloss]**.

3.9 EXTERIOR PAINTING SCHEDULE, METAL SUBSTRATES

A. Steel and Iron Substrates:

1. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: **[Zinc-rich, inorganic primer]** **[Alkyd metal primer]** **[Acrylic metal primer]** **[Epoxy metal primer]** **[Shop primer specified in Section in which substrate is specified]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen]** **[semigloss]** **[gloss]**.

2. Water-Based, Light Industrial Coating over Epoxy System: <Insert drawing designation>
 - a. Prime Coat: Epoxy metal primer.
 - b. Intermediate Coat: High-build epoxy paint, low gloss.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Alkyd metal primer] [Surface-tolerant metal primer] [Shop primer specified in Section in which substrate is specified].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Alkyd metal primer] [Quick-dry, alkyd metal primer] [Surface-tolerant metal primer] [Shop primer specified in Section in which substrate is specified].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
 5. Quick-Dry Enamel System: <Insert drawing designation>
 - a. Prime Coat: Quick-dry, alkyd metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Quick-dry alkyd enamel, [semigloss] [gloss].
 6. Aluminum Paint System: <Insert drawing designation>
 - a. Prime Coat: [Alkyd metal primer] [Shop primer specified in Section in which substrate is specified].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
- B. Galvanized Metal Substrates:
1. Latex System: <Insert drawing designation>
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 2. Water-Based, Light Industrial Coating System: <Insert drawing designation>
 - a. Prime Coat: [Water-based, galvanized-metal primer] [Epoxy metal primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
 4. Water-Based Alkyd System: <Insert drawing designation>

- a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
5. Aluminum Paint System: <Insert drawing designation>
- a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
6. High Performance Architectural Latex System: <Insert drawing designation>
- a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].
7. Bituminous Coating System: <Insert drawing designation>
- a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Bituminous coating.
- C. Aluminum (Not Anodized or Otherwise Coated) Substrates:
1. Latex System: <Insert drawing designation>
- a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
2. Water-Based, Light Industrial Coating System: <Insert drawing designation>
- a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
3. Alkyd System: <Insert drawing designation>
- a. Pretreatment Coat: Vinyl wash primer.
 - b. Prime Coat: Quick-dry aluminum primer.
 - c. Intermediate Coat: Matching topcoat.
 - d. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
4. Water-Based Alkyd System: <Insert drawing designation>
- a. Prime Coat: [Quick-dry aluminum primer] [Vinyl wash primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
5. High Performance Architectural Latex System: <Insert drawing designation>
- a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].

6. Aluminum Paint System: **<Insert drawing designation>**
 - a. Pretreatment Prime Coat: Vinyl wash primer.
 - b. Prime Coat: Quick-dry aluminum primer.
 - c. Intermediate Coat: Matching topcoat.
 - d. Topcoat: Aluminum paint.
 7. Bituminous Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Bituminous coating.
- D. Copper Substrates:
1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat]** **[low sheen]** **[semigloss]** **[gloss]**.
 2. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen]** **[semigloss]** **[gloss]**.
 3. Alkyd System: **<Insert drawing designation>**
 - a. Pretreatment Coat: **[Vinyl wash]** **[Quick-dry aluminum]** primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat]** **[semigloss]** **[gloss]**.
 4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: **[Quick-dry aluminum primer]** **[Vinyl wash primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen]** **[semigloss]** **[gloss]**.
 5. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen]** **[semigloss]**.
 6. Aluminum Paint System: **<Insert drawing designation>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
 7. Bituminous Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Bituminous coating.

E. Stainless Steel Substrates:

1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
2. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Quick-dry aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen] [semigloss] [gloss]**.
3. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat] [semigloss] [gloss]**.
4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: **[Solvent-based bonding primer] [Alkyd metal primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen] [semigloss] [gloss]**.
5. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.
6. Aluminum Paint System: **<Insert drawing designation>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.

3.10 EXTERIOR PAINTING SCHEDULE, WOOD SUBSTRATES

A. Glue-Laminated Wood Substrates:

1. Latex over Latex Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
2. Latex over Alkyd Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 - 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
 - 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
 - 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].
- B. Exposed Wood-Framed Substrates:
 - 1. Latex over Latex Primer System: <Insert drawing designation>
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 - 2. Latex over Alkyd Primer System: <Insert drawing designation>
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 - 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
 - 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
 - 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].
- C. Dressed-Wood Substrates: [Wood trim] [Architectural woodwork] [Doors] [Windows] [Wood board siding] [Railings] [and] [Fences] <Insert requirements>.

1. Latex over Latex Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
 2. Latex over Alkyd Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
 3. Water-Based, Light Industrial Coating System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, **[low sheen] [semigloss] [gloss]**.
 4. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat] [semigloss] [gloss]**.
 5. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: **[Exterior, latex wood primer] [Exterior, alkyd wood primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen] [semigloss] [gloss]**.
 6. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Exterior, latex wood primer] [Exterior, alkyd wood primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.
- D. Wood-Based Panel Substrates:
1. Latex over Latex Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
 2. Latex over Alkyd Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
 3. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Exterior alkyd paint, **[flat]** **[semigloss]** **[gloss]**.
- 4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: **[Exterior, latex wood primer]** **[Exterior, alkyd wood primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen]** **[semigloss]** **[gloss]**.
- 5. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: **[Exterior, latex wood primer]** **[Exterior, alkyd wood primer]**.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen]** **[semigloss]**.
- E. Wood-Board, Traffic-Surface Substrates: **[Lumber decking]** **[and]** **[stairs]**
 - 1. Latex Porch and Floor Enamel over Latex Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Latex floor enamel, **[low gloss]** **[gloss]**.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 - 2. Latex Porch and Floor Enamel over Alkyd Primer System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Latex floor enamel, **[low gloss]** **[gloss]**.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 - 3. Latex Deck Coating System (for Plywood Decks): **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommending in writing by topcoat manufacturer.
 - c. Topcoat: Latex deck coating.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 - 4. Alkyd Floor Enamel System: **<Insert drawing designation>**
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Alkyd floor enamel, **[low gloss]** **[gloss]**.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 - 5. Alkyd Floor Enamel over Wood Preservative System: **<Insert drawing designation>**
 - a. Preservative Coat: Exterior wood preservative.
 - b. Prime Coat: Matching topcoat.
 - c. Intermediate Coat: Matching topcoat.
 - d. Topcoat: Alkyd floor enamel, **[low gloss]** **[gloss]**.
 - e. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- F. Wood Shingle and Shake Siding Substrates:
 - 1. Latex over Latex Primer System: **<Insert drawing designation>**

- a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
- 2. Latex over Alkyd Primer System: <Insert drawing designation>
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
- 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Exterior, alkyd wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
- 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
- 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: [Exterior, latex wood primer] [Exterior, alkyd wood primer].
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].

3.11 EXTERIOR PAINTING SCHEDULE, MISCELLANEOUS SUBSTRATES

A. Fiberglass Substrates:

- 1. Latex System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
- 2. Water-Based, Light Industrial Coating System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
- 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
- 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
 - 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].
- B. Plastic Trim Fabrication Substrates:
 - 1. Latex System: <Insert drawing designation>
 - a. Prime Coat: [Solvent] [Water]-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 - 2. Water-Based, Light Industrial Coating System: <Insert drawing designation>
 - a. Prime Coat: [Solvent] [Water]-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].
 - 3. Alkyd System: <Insert drawing designation>
 - a. Prime Coat: [Solvent] [Water]-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, [flat] [semigloss] [gloss].
 - 4. Water-Based Alkyd System: <Insert drawing designation>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, [low sheen] [semigloss] [gloss].
 - 5. High Performance Architectural Latex System: <Insert drawing designation>
 - a. Prime Coat: [Solvent] [Water]-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, [low sheen] [semigloss].
- C. Exterior Canvas and Cotton Substrates:
 - 1. Latex System: <Insert drawing designation>
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, [flat] [low sheen] [semigloss] [gloss].
 - 2. Water-Based, Light Industrial Coating System: <Insert drawing designation>
 - a. Prime Coat: Matching topcoat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, water-based, light industrial coating, [low sheen] [semigloss] [gloss].

3. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior latex paint, flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat] [semigloss] [gloss]**.
4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior latex paint, flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen] [semigloss] [gloss]**.
5. Aluminum Paint System: **<Insert drawing designation>**
 - a. Prime Coat: Exterior latex paint, flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
6. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.

D. Exterior Bituminous-Coated Substrates:

1. Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, **[flat] [low sheen] [semigloss] [gloss]**.
2. Latex Aggregate System: **<Insert drawing designation>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured latex coating, **[flat] [nonflat]**.
3. Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior alkyd paint, **[flat] [semigloss] [gloss]**.
4. Water-Based Alkyd System: **<Insert drawing designation>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior water-based alkyd paint, **[low sheen] [semigloss] [gloss]**.
5. Aluminum Paint System: **<Insert drawing designation>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Aluminum paint.
- 6. High Performance Architectural Latex System: **<Insert drawing designation>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior, high performance architectural latex, **[low sheen] [semigloss]**.

END OF SECTION 09 91 13 00



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SECTION 09 91 13 00A - HIGH-TEMPERATURE-RESISTANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation of steel substrates and application of the following:
 - 1. High-temperature-resistant coating systems.
- B. Related Requirements:
 - 1. **[Section 051200 "Structural Steel Framing"]****[Section 051213 "Architecturally Exposed Structural Steel Framing"]** for shop priming structural steel substrates with primers specified in this Section.
 - 2. **[Section 099113 "Exterior Painting"]****[Section 099114 "Exterior Painting (MPI Standards)"]** for general field painting.
 - 3. **[Section 099123 "Interior Painting"]****[Section 099124 "Interior Painting (MPI Standards)"]** for general field painting.
 - 4. **[Section 099600 "High-Performance Coatings"]****[Section 099601 "High-Performance Coatings (MPI Standards)"]** for tile-like coatings.

1.2 DEFINITIONS

- A. MPI Gloss Level G6: Between 70 to 85 units at 60 degrees, in accordance with ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Include preparation requirements and application instructions.
 - 3. Indicate VOC content.
- B. Samples: For each type of topcoat product.
- C. Samples for Initial Selection: For each type of topcoat product indicated.
- D. Samples for Verification: For each type of coating system and in each color and gloss of topcoat. Submit **[actual coating drawdowns as specified below]****[coating manufacturer's standard printed cards]** for verification Samples.
 - 1. Submit Samples on rigid backing, **8 inches (200 mm)** square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same production run (batch number),**] that match coating system products applied and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Coatings: [**5**<Insert number> percent, but not less than [**1 gal. (3.8 L)**]<Insert value> of each material and color applied.

1.5 MOCKUPS

- A. Apply mockups of each coating system and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Surfaces Greater Than 200 sq. ft. (18.5 sq. m): Provide mockups of at least **100 sq. ft. (9 sq. m)**.
 - b. Other Surfaces: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between **50 and 104 deg F (10 and 40 deg C)**.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

- C. Do not apply coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each coating system product from single source from single manufacturer.

2.2 HIGH-TEMPERATURE-RESISTANT COATINGS

- A. High-Temperature-Resistant Coating Systems: Subject to compliance with requirements, provide **[product][one of the products][available products that may be incorporated into the Work include, but are not limited to, products]** listed in "High-Temperature-Resistant Coating Schedule" Article for the coating category indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Benjamin Moore & Co.]**
 - b. **[Cloverdale Paint]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Corotech Coatings; Benjamin Moore & Co.]**
 - e. **[Diamond Vogel Paint Company]**
 - f. **[PPG Paints; PPG Industries, Inc.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Benjamin Moore & Co.]**
 - b. **[Cloverdale Paint]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Corotech Coatings; Benjamin Moore & Co.]**
 - e. **[Diamond Vogel Paint Company]**
 - f. **[PPG Paints; PPG Industries, Inc.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **<Insert manufacturer's name>**
- B. MPI Standards: Provide products complying with MPI standards indicated in "High-Temperature-Resistant Coating Schedule" Article for the coating category indicated and listed in the "MPI Approved Products List."
- C. Material Compatibility:
1. Materials for use within each coating system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coating in the system, provide products recommended in writing by topcoat manufacturers for use in coating system and on substrate indicated.

- D. VOC Content: For field applications[**that are inside the weatherproofing system**], verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Rust-Preventive Coatings: 100 g/L.
 2. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
- E. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify paints and coatings comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. VOC Content: For field applications[**that are inside the weatherproofing system**], verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Rust-Preventive Coatings: 100 g/L.
 2. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
- G. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify paints and coatings comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Material Emissions and Pollutant Control: Verify field-applied paints and coatings that are inside the weatherproofing system comply with either of the following:
1. Low-Emitting Materials: Verify VOC emissions comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 2. Verify VOC content does not exceed limits of authorities having jurisdiction and the following:
 - a. Industrial Maintenance Coatings: 250 g/L.
 - b. Rust-Preventive Coatings: 250 g/L.
- I. Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples]<Insert requirements>**.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor will remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions[**and recommendations in "MPI Architectural Painting Specification Manual"**] applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by coating manufacturer[.][**but not less than the following:**]
 - 1. SSPC-SP 7/NACE No. 4.
 - 2. SSPC-SP 11.
 - 3. SSPC-SP 6/NACE No. 3.
 - 4. SSPC-SP 10/NACE No. 2.
 - 5. SSPC-SP 5/NACE No. 1.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION OF HIGH-TEMPERATURE-RESISTANT COATINGS

- A. Apply high-temperature-resistant coating systems in accordance with manufacturer's written instructions[**and recommendations in "MPI Architectural Painting Specification Manual"**].
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written instructions, apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written instructions.
 - 3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

- A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 HIGH-TEMPERATURE-RESISTANT COATING SCHEDULE

- A. Heat-Resistant Enamel System: Maximum **400 deg F (205 deg C)**; **[MPI EXT 5.2A][and][MPI INT 5.2A]**.
 - 1. Prime Coat: Primer recommended in writing for use in coating system and under conditions indicated by manufacturer of topcoat.
 - 2. Topcoat: Heat-resistant coating (MPI Gloss Level G6)[, **MPI #21**]. Provide number of topcoats recommended in writing for use in coating system and under conditions indicated by manufacturer[**but not less than two**].
 - a. **<Insert manufacturer's name; product name or designation>**.
- B. Heat-Resistant Aluminum Enamel System: Maximum **800 deg F (427 deg C)**; **[MPI EXT 5.2B][and][MPI INT 5.2B]**.
 - 1. Prime Coat: Primer recommended in writing for use in coating system and under conditions indicated by manufacturer of topcoat.
 - 2. Topcoat: Aluminum paint, heat resistant[, **MPI #2**]. Provide number of topcoats recommended in writing for use in coating system and under conditions indicated by manufacturer[**but not less than two**].
 - a. **<Insert manufacturer's name; product name or designation>**.

- C. Inorganic Zinc-Rich Coating System: Maximum **750 deg F (400 deg C)**; [MPI EXT 5.2C][and][MPI INT 5.2C].
1. Prime Coat: Primer, zinc rich, inorganic, matching topcoat.
 2. Topcoat: Primer, zinc rich, inorganic, **MPI #19**. Provide number of topcoats recommended in writing for use in coating system and under conditions indicated by manufacturer[**but not less than two**].
 - a. <Insert manufacturer's name; product name or designation>.
- D. High-Heat-Resistant Coating System: Maximum **1100 deg F (593 deg C)**; [MPI EXT 5.2D][and][MPI INT 5.2D].
1. Prime Coat: Primer recommended in writing for use in coating system and under conditions indicated by manufacturer of topcoat.
 2. Topcoat: Aluminum paint, high heat, **MPI #22**. Provide number of topcoats recommended in writing for use in coating system and under conditions indicated by manufacturer[**but not less than two**].
 - a. <Insert manufacturer's name; product name or designation>.

END OF SECTION 09 91 13 00A



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Task	Specification	Specification Description
09 91 13 00	01 11 19 00	No Specification Required
09 91 13 00	09 93 00 00	Staining and Transparent Finishing



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SECTION 09 91 23 00 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation of interior substrates and application of the following:

1. Primers.
2. Water-based finish coatings.
3. Solvent-based finish coatings.
4. Floor sealers and paints.
5. Dry fall coatings.

B. Related Requirements:

1. **[Section 051200 "Structural Steel Framing"]****[Section 051213 "Architecturally Exposed Structural Steel Framing"]** for shop priming structural steel substrates.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
4. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
5. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
6. Section 055213 "Pipe and Tube Railings" for shop **[priming]****[painting]** pipe and tube railings.
7. **[Section 055313 "Bar Gratings"]****[Section 055316 "Plank Gratings"]****[Section 055319 "Expanded Metal Gratings"]** for shop priming metal gratings.
8. Section 099113 "Exterior Painting."
9. Section 099300 "Staining and Transparent Finishing" for surface preparation and application of wood stains and transparent finishes on interior wood substrates.
10. Section 099600 "High-Performance Coatings" for tile-like coatings.
11. Section 321723 "Pavement Markings" for pavement-marking paints.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and each color and gloss of topcoat. Submit **[actual paint drawdowns as specified below]****[paint manufacturer's standard printed cards]** for verification Samples.

1. Submit Samples on rigid backing, **8 inches (200 mm)** square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in applicable interior painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.
- F. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Environmental Product Declaration (EPD): For each product.
 - 3. Health Product Declaration (HPD): For each product.
 - 4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 - 5. Environmental Product Declaration (EPD): For each product.
 - 6. Health Product Declaration (HPD): For each product.
 - 7. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 - 8. Environmental Product Declaration (EPD): For each product.
 - 9. Environmental Product Declaration (EPD): For each product.
 - 10. Environmental Product Declaration (EPD): For each product.
 - 11. Third-Party Certifications: For each product.
 - 12. Third-Party-Certified Life-Cycle Assessment: For each product.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match paint products applied and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint Products: **[5]<Insert number>** percent, but not less than **[1 gal. (3.8 L)]<Insert value>** of each material and color applied.

1.4 MOCKUPS

- A. Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft. (9 sq. m)**.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each paint product from single source from single manufacturer.

2.2 INTERIOR PAINTS, GENERAL

- A. Interior Paints: Subject to compliance with requirements, **[provide product][provide one of the products][available products that may be incorporated into the Work include but are not limited to products]** listed in product types below and applicable interior painting schedule articles for the paint category indicated.
- B. Material Compatibility:
 - 1. Materials for use within each paint system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.
- C. VOC Content: For field applications **[that are inside the weatherproofing system]**, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Primers, Sealers, and Undercoaters: 100 g/L.
 - 4. Rust-Preventive Coatings: 100 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 50 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.



- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify 90 percent of paints and coatings comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Material Emissions and Pollutant Control: Verify not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system comply with either of the following:
 - 1. Low-Emitting Materials: Verify VOC emissions comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 2. Verify VOC content does not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Nonflat - High-Gloss Coatings: 150 g/L.
 - d. Concrete/Masonry Sealers: 100 g/L.
 - e. Floor Coatings: 100 g/L.
 - f. Industrial Maintenance Coatings: 250 g/L.
 - g. Low-Solids Coatings: 120 g/L.
 - h. Mastic Texture Coatings: 100 g/L.
 - i. Metallic Pigmented Coatings: 500 g/L.
 - j. Pretreatment Wash Primers: 420 g/L.
 - k. Primers, Sealers, and Undercoaters: 100 g/L.
 - l. Reactive Penetrating Sealers: 350 g/L.
 - m. Recycled Coatings: 250 g/L.
 - n. Rust-Preventive Coatings: 250 g/L.
- F. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- G. Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule]<Insert requirements>** .
 - 1. **[10][20][30]<Insert number>** percent of surface area will be painted with deep tones.

2.3 PRIMERS

- A. Latex Block Filler: Water-based, pigmented, high-solids, emulsion coating formulated to bridge and fill porous surfaces of CMU substrates in preparation for specified subsequent coatings.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rust-Oleum Corporation]**

- d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **[Valspar; a brand of The Sherwin-Williams Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rust-Oleum Corporation]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **[Valspar; a brand of The Sherwin-Williams Company]**
 - g. **<Insert manufacturer's name>**
- B. Alkali-Resistant, Water-Based Primer: Water-based primer formulated for use on alkaline substrates.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
- C. Interior Latex Primer Sealer: Pigmented, water-based latex sealer; formulated to reduce porosity of substrate for finish coats; for use on new interior plaster, concrete, and gypsum board substrates. Not intended for use on wood or previously painted surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Hempel (USA), Inc.]**

- d. **[McCormick Paints]**
 - e. **[Rodda Paint Co.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **[The Pittsburgh Paints Company]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Hempel (USA), Inc.]**
 - d. **[McCormick Paints]**
 - e. **[Rodda Paint Co.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **[The Pittsburgh Paints Company]**
 - h. **<Insert manufacturer's name>**
- D. Interior, Institutional Low-Odor/VOC Primer Sealer: Water-based primer sealer with low-odor characteristics and a VOC of less than 10 grams per liter for use on new interior plaster, concrete, and gypsum wallboard surfaces that are subsequently to be painted with latex finish coats.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
- E. Interior, Latex Primer for Wood: Waterborne-emulsion primer formulated for resistance to extractive bleeding, mold, and microbials; for hiding stains; and for use on interior wood substrates.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[KILZ (Behr Paint Company)]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **[Valspar; a brand of The Sherwin-Williams Company]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[KILZ (Behr Paint Company)]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **[Valspar; a brand of The Sherwin-Williams Company]**
 - h. **<Insert manufacturer's name>**
- F. Interior Alkyd Primer Sealer: Solvent-based, alkyd-type, primer/sealer for new interior wood, plaster, and porous surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
- G. Water-Based Alkyd Primer Sealer: Waterborne-emulsion primer/sealer formulated for new interior gypsum board and plaster substrates.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

-
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
- H. Water-Based, Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer; formulated for resistance to flash rusting when applied to cleaned, ferrous metal substrates subject to mildly corrosive environments.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
- I. Quick-Drying, Alkyd Metal Primer: Corrosion-resistant, solvent-based, modified-alkyd primer; lead and chromate free; formulated for quick-drying capabilities and for use on cleaned, ferrous metal substrates.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Benjamin Moore & Co.]**
 - b. **[Hempel (USA), Inc.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**

- e. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Benjamin Moore & Co.]
 - b. [Hempel (USA), Inc.]
 - c. [Sherwin-Williams Company (The)]
 - d. [The Pittsburgh Paints Company]
 - e. <Insert manufacturer's name>
- J. Alkyd Metal Primer: Corrosion-resistant, solvent-based, alkyd primer formulated for use on prepared ferrous metal substrates subject to industrial and light marine environments.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Benjamin Moore & Co.]
 - b. [Hempel (USA), Inc.]
 - c. [McCormick Paints]
 - d. [Sherwin-Williams Company (The)]
 - e. [The Pittsburgh Paints Company]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Benjamin Moore & Co.]
 - b. [Hempel (USA), Inc.]
 - c. [McCormick Paints]
 - d. [Sherwin-Williams Company (The)]
 - e. [The Pittsburgh Paints Company]
 - f. <Insert manufacturer's name>
- K. Epoxy, Anticorrosive Primer: Solvent-based, two-component, epoxy, anticorrosive primer; formulated for use on ferrous and galvanized metal substrates.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Benjamin Moore & Co.]
 - b. [Carboline Company; a subsidiary of RPM International]
 - c. [Diamond Vogel Paint Company]
 - d. [Hempel (USA), Inc.]
 - e. [Sherwin-Williams Company (The)]
 - f. [The Pittsburgh Paints Company]
 - g. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. **[Benjamin Moore & Co.]**
 - b. **[Carboline Company; a subsidiary of RPM International]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[Hempel (USA), Inc.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
- L. Surface-Tolerant Metal Primer: Corrosion-resistant, solvent-based metal primer formulated for use on structural steel and metal fabrications that have been minimally prepared.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
- M. Water-Based, Galvanized-Metal Primer: Corrosion-resistant, pigmented, acrylic primer; formulated for use on cleaned/etched galvanized metal substrates to prepare it for subsequent water-based coatings.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**

- c. **[Rodda Paint Co.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **[The Pittsburgh Paints Company]**
 - f. **<Insert manufacturer's name>**
- N. Quick-Drying Aluminum Primer: Corrosion-resistant, solvent-based, alkyd or modified-alkyd primer formulated for quick-drying capabilities and for use on prepared aluminum substrates.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[The Pittsburgh Paints Company]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[The Pittsburgh Paints Company]**
 - c. **<Insert manufacturer's name>**
- O. Vinyl Wash Primer: Two-component, vinyl butyral/phosphoric acid-wash primer formulated for use over cleaned ferrous metal substrates and zinc-rich primers as a tie coat for subsequent corrosion-resistant primers or finish coatings.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
- P. Water-Based Bonding Primer: Water-based-emulsion primer formulated to promote adhesion of subsequent specified coatings.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**

- e. **[Valspar; a brand of The Sherwin-Williams Company]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **[Valspar; a brand of The Sherwin-Williams Company]**
 - f. **<Insert manufacturer's name>**
- Q. Solvent-Based Bonding Primer: Solvent-based primer formulated to seal substrates and promote adhesion of specified subsequent coatings.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[Benjamin Moore & Co.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **[The Pittsburgh Paints Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Benjamin Moore & Co.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **[The Pittsburgh Paints Company]**
 - d. **<Insert manufacturer's name>**
- R. Wood-Knot Sealer: White shellac or other sealer recommended in writing by topcoat manufacturer.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Sherwin-Williams Company (The)]**

d. <Insert manufacturer's name>

2.4 WATER-BASED FINISH COATINGS

- A. Interior Latex Paint: Pigmented, water-based coating for use on interior primed/sealed plaster and gypsum board, and on primed wood and metals.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Insl-X Products; Benjamin Moore & Co.]**
 - e. **[McCormick Paints]**
 - f. **[Rodda Paint Co.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **[The Pittsburgh Paints Company]**
 - i. **[Valspar; a brand of The Sherwin-Williams Company]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Insl-X Products; Benjamin Moore & Co.]**
 - e. **[McCormick Paints]**
 - f. **[Rodda Paint Co.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **[The Pittsburgh Paints Company]**
 - i. **[Valspar; a brand of The Sherwin-Williams Company]**
 - j. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: Manufacturer's standard **[flat][low sheen][eggshell][satin][semigloss][gloss]** .
- B. Interior, Latex, Institutional Low-Odor/VOC Paint: White or colored latex coating with low-odor characteristics and a VOC of less than 10 grams per liter, for use in areas, such as hospitals and other occupied buildings, where the odor and VOC levels of conventional latex products would preclude their use.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**

- e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: Manufacturer's standard **[flat][low sheen][eggshell][satin][semigloss][gloss]** .
- C. Interior, Water-Based Light Industrial Coating: Pigmented, water-based emulsion coating for interior primed wood and metal surfaces (e.g., walls, doors, frames, trim, and sash), providing resistance to moderate abrasion and mild chemical exposure and corrosive conditions.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[McCormick Paints]**
 - d. **[Rodda Paint Co.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **[The Pittsburgh Paints Company]**
 - g. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: Manufacturer's standard **[eggshell][semigloss][gloss]** .
- D. Interior, High-Performance Architectural Latex: Water-based, pigmented, low-VOC, emulsion coating formulated to provide a significantly higher level of performance than conventional latex paints in the areas of scrub resistance, burnish resistance, and ease of stain removal.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Rodda Paint Co.]
- d. [Sherwin-Williams Company (The)]
- e. [The Pittsburgh Paints Company]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Rodda Paint Co.]
- d. [Sherwin-Williams Company (The)]
- e. [The Pittsburgh Paints Company]
- f. <Insert manufacturer's name>

3. Gloss and Sheen Level: Manufacturer's standard [low sheen][eggshell][satin][semigloss] .

- E. High-Performance Textured Latex Coating: Water-based, pigmented, self-priming coating that contains sand or other hard aggregate for selected texture and is formulated for use on concrete and masonry substrates.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Sherwin-Williams Company (The)]
- d. [The Pittsburgh Paints Company]
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Sherwin-Williams Company (The)]
- d. [The Pittsburgh Paints Company]
- e. <Insert manufacturer's name>

3. Gloss and Sheen Level: Manufacturer's standard [flat][nonflat] .

4. Texture: [Manufacturer's standard][Fine][Medium][Coarse] .

- F. Interior, Water-Based Alkyd Paint: Water-based, pigmented, low-VOC alkyd paint formulated for flash rust and water resistance and for use on interior, primed, wood, plaster, masonry, and metal surfaces.

1. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[Benjamin Moore & Co.]**
- c. **[Sherwin-Williams Company (The)]**
- d. **[The Pittsburgh Paints Company]**
- e. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[Benjamin Moore & Co.]**
- c. **[Sherwin-Williams Company (The)]**
- d. **[The Pittsburgh Paints Company]**
- e. **<Insert manufacturer's name>**

3. Gloss and Sheen Level: Manufacturer's standard **[low sheen][semigloss][gloss]** .

- G. Interior Latex, Antiviral/Antibacterial Coating: Water-based, pigmented, low-VOC paint with EPA-registered proprietary antimicrobial copper ion technology formulated to kill 99 percent of viruses and bacteria within 2 hours, for use on interior, primed, concrete, masonry, metal, wood, gypsum board, and plaster surfaces.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[The Pittsburgh Paints Company]**
- c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[The Pittsburgh Paints Company]**
- c. **<Insert manufacturer's name>**

3. Gloss Level: Manufacturer's standard **[eggshell][semigloss]** .

2.5 SOLVENT-BASED FINISH COATINGS

- A. Interior Alkyd Paint: Pigmented, solvent-based alkyd coating for use on primed/sealed interior plaster, gypsum, wood, and metal substrates primarily in moderate traffic commercial environments.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following] :

- a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [Rodda Paint Co.]
 - d. [Sherwin-Williams Company (The)]
 - e. [The Pittsburgh Paints Company]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [Rodda Paint Co.]
 - d. [Sherwin-Williams Company (The)]
 - e. [The Pittsburgh Paints Company]
 - f. <Insert manufacturer's name>
 3. Gloss and Sheen Level: Manufacturer's standard [flat][eggshell][semigloss][gloss] .
- B. Aluminum Paint: Aliphatic, solvent-based coating consisting of varnish or alkyd binder combined with aluminum pigment that is formulated for use as a stain-blocking coating and sealer, is able to be recoated with conventional alkyd and latex paints, and for use on wood, metal, bituminous-coated, and prepared masonry substrates.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Benjamin Moore & Co.]
 - b. [Rodda Paint Co.]
 - c. [Sherwin-Williams Company (The)]
 - d. [The Pittsburgh Paints Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Benjamin Moore & Co.]
 - b. [Rodda Paint Co.]
 - c. [Sherwin-Williams Company (The)]
 - d. [The Pittsburgh Paints Company]
 - e. <Insert manufacturer's name>

2.6 FLOOR SEALERS AND PAINTS

- A. Concrete Stain: Penetrating semitransparent stain specifically manufactured for concrete horizontal and vertical surfaces.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]
- d. [Sherwin-Williams Company (The)]
- e. [The Pittsburgh Paints Company]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]
- d. [Sherwin-Williams Company (The)]
- e. [The Pittsburgh Paints Company]
- f. <Insert manufacturer's name>

- B. Latex Floor Enamel: Water-based, pigmented coating formulated to hide stains, for alkali and incidental water resistance, and for use on concrete and primed-wood substrates subject to low to medium foot traffic.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Sherwin-Williams Company (The)]
- c. [The Pittsburgh Paints Company]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Sherwin-Williams Company (The)]
- c. [The Pittsburgh Paints Company]
- d. <Insert manufacturer's name>

3. Gloss and Sheen Level: Manufacturer's standard [low gloss][gloss] .
4. Slip-Resistant Aggregate: Manufacturer's standard additive.

- C. Alkyd Floor Enamel: Solvent-based, pigmented coating; self-priming where applied to bare wood; formulated to hide stains, for durability, for microbial and abrasion resistance, and for use on wood-board substrates subject to low to medium foot traffic.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. **[Benjamin Moore & Co.]**
 - b. **[The Pittsburgh Paints Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Benjamin Moore & Co.]**
 - b. **[The Pittsburgh Paints Company]**
 - c. **<Insert manufacturer's name>**
 3. Gloss Level: Manufacturer's standard **[low gloss][gloss]** .
 4. Slip-Resistant Aggregate: Manufacturer's standard additive.
- D. Water-Based Concrete Floor Sealer: Clear, water-based, acrylic-copolymer-emulsion sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **[The Pittsburgh Paints Company]**
 - e. **<Insert manufacturer's name>**
- E. Solvent-Based Concrete Floor Sealer: Clear, acrylic, solvent-based sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Benjamin Moore & Co.]**
 - b. **[H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]**
 - c. **[Sherwin-Williams Company (The)]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Benjamin Moore & Co.]
- b. [H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.]
- c. [Sherwin-Williams Company (The)]
- d. <Insert manufacturer's name>

2.7 DRY FALL COATINGS

- A. Dry Fall, Latex: Pigmented, water-based, emulsion-type, fast-drying coating for use on interior plaster, concrete, gypsum board, primed wood, and metal ceilings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [McCormick Paints]
 - d. [Rodda Paint Co.]
 - e. [Sherwin-Williams Company (The)]
 - f. [The Pittsburgh Paints Company]
 - g. [Valspar; a brand of The Sherwin-Williams Company]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [McCormick Paints]
 - d. [Rodda Paint Co.]
 - e. [Sherwin-Williams Company (The)]
 - f. [The Pittsburgh Paints Company]
 - g. [Valspar; a brand of The Sherwin-Williams Company]
 - h. <Insert manufacturer's name>
3. Gloss and Sheen Level: Manufacturer's standard **[flat][eggshell][semigloss]** .

- B. Dry Fall, Water-Based for Galvanized Steel: Pigmented, water-based coating for direct application to cleaned, interior galvanized-metal ceiling surfaces and adjacent primed metals.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [Sherwin-Williams Company (The)]
 - d. [The Pittsburgh Paints Company]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[Benjamin Moore & Co.]**
- c. **[Sherwin-Williams Company (The)]**
- d. **[The Pittsburgh Paints Company]**
- e. **<Insert manufacturer's name>**

- 3. Gloss and Sheen Level: Manufacturer's standard **[flat][eggshell][semigloss]** .

- C. Dry Fall, Alkyd: Pigmented, solvent-based, fast-setting, alkyd coating for use on interior ceiling substrates such as primed plaster, gypsum board, wood, and metals.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[Benjamin Moore & Co.]**
- c. **[Rodda Paint Co.]**
- d. **[Sherwin-Williams Company (The)]**
- e. **[The Pittsburgh Paints Company]**
- f. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Behr Paint Company (Behr Process LLC)]**
- b. **[Benjamin Moore & Co.]**
- c. **[Rodda Paint Co.]**
- d. **[Sherwin-Williams Company (The)]**
- e. **[The Pittsburgh Paints Company]**
- f. **<Insert manufacturer's name>**

- 3. Gloss and Sheen Level: Manufacturer's standard **[flat][eggshell][semigloss]** .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Cementitious Composition Board: 12 percent.
 - 3. Masonry (Clay and CMU): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.

6. Plaster: 12 percent. Verify that plaster is fully cured.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by paint manufacturer [.]**[but not less than the following:]**

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.
4. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of wood-knot sealer.
2. Sand surfaces that will be exposed to view and remove sanding dust.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- K. Canvas and Cotton Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- L. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

- A. Apply paints in accordance with manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in the applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed to view in equipment rooms:
 - a. Equipment, including panelboards [**and switch gear**] .
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 2. Paint the following work where exposed to view in occupied spaces:

- a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
- 1. Touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.
 - 3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
 - 4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINTING SCHEDULE, CONCRETE SUBSTRATES

- A. Vertical (Nontraffic) Surfaces:

1. Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Alkali-resistant, water-based primer][Matching topcoat]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
2. Latex over Latex Aggregate System: **<Insert drawing designation.>**
 - a. Prime Coat: High-performance textured latex coating.
 - 1) Gloss and Sheen Level: Flat.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
3. Latex Aggregate System: **<Insert drawing designation.>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: High-performance textured latex coating.
 - 1) Gloss and Sheen Level: **[Flat][Nonflat]** .
4. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
5. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
7. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss][Gloss]** .

8. Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Alkali-resistant, water-based primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

9. Water-Based Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Alkali-resistant, water-based primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

10. Concrete Stain System: **<Insert drawing designation.>**

- a. First Coat: Matching topcoat.
- b. Topcoat: Concrete stain.

B. Horizontal (Traffic) Surfaces:

1. Latex Floor Enamel System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Latex floor enamel.
 - 1) Gloss and Sheen Level: **[Low gloss][Gloss]** .

2. Alkyd Floor Enamel System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Alkyd floor enamel.
 - 1) Gloss and Sheen Level: **[Low gloss][Gloss]** .

3. Concrete Stain System: **<Insert drawing designation.>**

- a. First Coat: Matching topcoat.
- b. Topcoat: Concrete stain.

4. Solvent-Based Concrete Floor Sealer System: **<Insert drawing designation.>**

- a. First Coat: Matching topcoat.
- b. Topcoat: Solvent-based concrete floor sealer.

5. Water-Based Concrete Floor Sealer System: **<Insert drawing designation.>**

- a. First Coat: Matching topcoat.
 - b. Topcoat: Water-based concrete floor sealer.
6. Latex Zone/Traffic-Marking Paint System: <Insert drawing designation.>
- a. As specified in Section 321723 "Pavement Markings."
7. Alkyd Zone/Traffic-Marking Paint System: <Insert drawing designation.>
- a. As specified in Section 321723 "Pavement Markings."

3.8 INTERIOR PAINTING SCHEDULE, CEMENTITIOUS SUBSTRATES

A. Cementitious Composition Board Substrates: [Siding][Trim][Panels]<Insert substrate> .

1. Latex System: <Insert drawing designation.>
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
- 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
2. Institutional Low-Odor/VOC Latex System: <Insert drawing designation.>
- a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
- 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
3. High-Performance Architectural Latex System: <Insert drawing designation.>
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
- 1) Gloss and Sheen Level: [Low sheen][Eggshell][Satin][Semigloss] .
4. Water-Based Light Industrial Coating System: <Insert drawing designation.>
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
- 1) Gloss and Sheen Level: [Eggshell][Semigloss][Gloss] .
5. Antiviral/Antibacterial Latex System: <Insert drawing designation.>
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
- 1) Gloss and Sheen Level: [Eggshell][Semigloss] .

6. Alkyd System: **<Insert drawing designation.>**
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
- 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

7. Water-Based Alkyd System: **<Insert drawing designation.>**
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
- 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

3.9 INTERIOR PAINTING SCHEDULE, MASONRY SUBSTRATES

A. Clay Masonry Substrates:

1. Latex System: **<Insert drawing designation.>**
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
- 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
2. Latex Aggregate System: **<Insert drawing designation.>**
- a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: High-performance textured latex coating.
- 1) Gloss and Sheen Level: **[Flat][Nonflat]** .
3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
- a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
- 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
- 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**

- a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss][Gloss]** .
- 6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
- 7. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
- 8. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Alkali-resistant, water-based primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
- B. CMU Substrates:
 - 1. Latex System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 - 2. Latex Aggregate System: **<Insert drawing designation.>**
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: High-performance textured latex coating.
 - 1) Gloss and Sheen Level: **[Flat][Nonflat]** .
 - 3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Prime Coat: Alkali-resistant, water-based primer.
 - c. Intermediate Coat: Matching topcoat.
 - d. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
 5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss][Gloss]** .
 6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
 7. Alkyd System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
 8. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
- 3.10 INTERIOR PAINTING SCHEDULE, METAL SUBSTRATES
- A. Steel and Iron Substrates:
1. Latex System, Alkyd Primer: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

2. Latex over Shop-Applied, Quick-Drying Shop Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Shop primer specified in **<Insert Section where substrate is specified>** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss][Gloss]** .
6. Water-Based Light Industrial Coating System over Epoxy Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Epoxy, anticorrosive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss][Gloss]** .
7. Water-Based Dry-Fall System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Topcoat: **[Dry fall, latex][Dry fall, water-based for galvanized steel]** .
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss]** .
8. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying, alkyd metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.

- 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
9. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
10. Alkyd over Surface-Tolerant Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Surface-tolerant metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][semigloss][gloss]** .
11. Alkyd over Rust-Inhibitive Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
12. Alkyd over Shop-Applied, Quick-Drying Shop Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Shop primer specified in **<Insert Section where substrate is specified>** .
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
13. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Quick-drying primer for shop application][Water-based, rust-inhibitive primer][Surface-tolerant metal primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
14. Quick-Drying Enamel System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying, alkyd metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
15. Alkyd Dry-Fall System **<Insert drawing designation.>**

- a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Topcoat: Dry fall, alkyd.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss]** .
16. Alkyd Dry Fall over Quick-Drying Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying, alkyd metal primer.
 - b. Topcoat: Dry fall, alkyd.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss]** .
17. Aluminum Paint System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Quick-drying, alkyd metal primer][Alkyd metal primer][Shop primer specified in Section where substrate is specified]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
- B. Galvanized Metal Substrates:
 1. Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 2. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 3. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
 4. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, galvanized-metal primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
 5. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Water-based, galvanized-metal primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex, antiviral/antibacterial coating.

1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .

6. Water-Based Dry-Fall System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Topcoat: Dry fall, water-based for galvanized steel.

1) Gloss and Sheen Level: Flat.

7. Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Water-based, galvanized-metal primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

8. Water-Based Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Water-based, galvanized-metal primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based alkyd paint.

1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

9. Alkyd Dry-Fall System: **<Insert drawing designation.>**

- a. Prime Coat: Water-based, galvanized-metal primer.
- b. Topcoat: Dry fall, alkyd.

1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss]** .

10. Aluminum Paint System: **<Insert drawing designation.>**

- a. Prime Coat: Water-based, galvanized-metal primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Aluminum paint.

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

2. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 3. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
 4. Aluminum Paint System: **<Insert drawing designation.>**
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
 5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
 6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
 7. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Primer, **[Vinyl wash primer][Quick-drying aluminum primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
 8. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
- D. Copper Substrates:
1. Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

2. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, latex, institutional low-odor/VOC paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

3. High-Performance Architectural Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, high-performance architectural latex.

1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .

4. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based light industrial coating.

1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

5. Aluminum Paint System: **<Insert drawing designation.>**

- a. Prime Coat: Vinyl wash primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Aluminum paint.

6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Quick-drying aluminum primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex, antiviral/antibacterial coating.

1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .

7. Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Vinyl wash primer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

E. Stainless Steel Substrates:

1. Latex System: <Insert drawing designation.>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
2. High-Performance Architectural Latex System: <Insert drawing designation.>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: [Low sheen][Eggshell][Satin][Semigloss] .
3. Water-Based Light Industrial Coating System: <Insert drawing designation.>
 - a. Prime Coat: [Solvent-based bonding primer][Quick-drying aluminum primer] .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: [Low sheen][Semigloss][Gloss] .
4. Aluminum Paint System: <Insert drawing designation.>
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
5. Antiviral/Antibacterial Latex System: <Insert drawing designation.>
 - a. Prime Coat: Quick-drying aluminum primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: [Eggshell][Semigloss] .
6. Alkyd System: <Insert drawing designation.>
 - a. Prime Coat: Vinyl wash primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Semigloss][Gloss] .

3.11 INTERIOR PAINTING SCHEDULE, WOOD SUBSTRATES

A. Glued-Laminated Wood Substrates:

1. Latex over Latex Primer System: <Insert drawing designation.>
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
- 2. Latex over Alkyd Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
- 3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
- 4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
- 5. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
- 6. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
- 7. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

B. Exposed Wood Framed Substrates:

1. Latex over Latex Primer System: <Insert drawing designation.>
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
2. Latex over Alkyd Primer System: <Insert drawing designation.>
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
3. Institutional Low-Odor/VOC Latex System: <Insert drawing designation.>
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
4. High-Performance Architectural Latex System: <Insert drawing designation.>
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: [Low sheen][Eggshell][Satin][Semigloss] .
5. Antiviral/Antibacterial Latex System: <Insert drawing designation.>
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: [Eggshell][Semigloss] .
6. Alkyd System: <Insert drawing designation.>
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Semigloss][Gloss] .
7. Water-Based Alkyd System: <Insert drawing designation.>
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: [Low sheen][Semigloss][Gloss] .

- C. Finish Carpentry Substrates: **[Wood trim][Doors][Windows][and][Wood board paneling]** .
1. Latex over Latex Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 2. Latex over Alkyd Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
 5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
 6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
 7. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
- 8. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
- D. Architectural Woodwork Substrates: **[Wood paneling][and][Casework]** .
 - 1. Latex over Latex Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 - 2. Latex over Alkyd Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 - 3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 - 4. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
 - 5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
 - 6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Interior, latex primer for wood.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex, antiviral/antibacterial coating.

1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .

7. Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

8. Water-Based Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: Interior, latex primer for wood.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based alkyd paint.

1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

E. Wood Traffic Substrates: **[Floors][and][stairs]** .

1. Latex Porch and Floor Enamel System **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Latex floor enamel.

1) Gloss and Sheen Level: Low gloss.

- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

2. Alkyd Floor Enamel System: **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Alkyd floor enamel.

1) Gloss and Sheen Level: Gloss.

- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

F. Wood Shingle and Shake Substrates:

1. Latex over Latex Primer System: **<Insert drawing designation.>**

- a. Prime Coat: Interior, latex primer for wood.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

2. Latex over Alkyd Primer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
3. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
4. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
5. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior, latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

3.12 INTERIOR PAINTING SCHEDULE, GYPSUM-BASED SUBSTRATES

A. Gypsum Board and Plaster Substrates:

1. Latex over Latex Sealer System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior latex primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
2. Latex over Alkyd Primer System (for Plaster Only): **<Insert drawing designation.>**
 - a. Prime Coat: Interior alkyd primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint:
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, latex, institutional low-odor/VOC paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

4. High-Performance Architectural Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Interior latex primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, high-performance architectural latex.

1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .

5. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**

- a. Prime Coat: Interior latex primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based light industrial coating.

1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

6. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**

- a. Prime Coat: **[Interior latex primer sealer][Interior, institutional low-odor/VOC primer sealer][Interior alkyd primer sealer]** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex, antiviral/antibacterial coating.

1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .

7. Alkyd over Latex Sealer System: **<Insert drawing designation.>**

- a. Prime Coat: **[Water-based alkyd primer sealer][Interior latex primer sealer]** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .

8. Water-Based Alkyd System: **<Insert drawing designation.>**

- a. Prime Coat: **[Water-based alkyd primer sealer][Interior latex primer sealer]** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based alkyd paint.

1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

3.13 INTERIOR PAINTING SCHEDULE, MISCELLANEOUS SUBSTRATES

A. Fiberglass Substrates:

1. Latex System: **<Insert drawing designation.>**

- a. Prime Coat: **[Solvent-based bonding primer][Water-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
2. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Water-based bonding primer][Solvent-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
3. High-Performance Architectural Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Solvent-based bonding primer][Water-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .
4. Water-Based Light Industrial Coating System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Solvent-based bonding primer][Water-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .
5. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Interior latex primer sealer][Interior, institutional low-odor/VOC primer sealer][Interior alkyd primer sealer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior Latex, Antiviral/Antibacterial Coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
6. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Solvent-based bonding primer][Water-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
7. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Solvent-based bonding primer][Water-based bonding primer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based alkyd paint.
 - 1) Gloss and Sheen Level: **[Low sheen][Semigloss][Gloss]** .

B. Plastic Trim Fabrication Substrates:

1. Latex System: <Insert drawing designation.>
 - a. Prime Coat: [Solvent-based bonding primer][Water-based bonding primer] .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
2. Institutional Low-Odor/VOC Latex System: <Insert drawing designation.>
 - a. Prime Coat: Water-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss] .
3. High-Performance Architectural Latex System: <Insert drawing designation.>
 - a. Prime Coat: [Solvent-based bonding primer][Water-based bonding primer] .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, high-performance architectural latex.
 - 1) Gloss and Sheen Level: [Low sheen][Eggshell][Satin][Semigloss] .
4. Water-Based Light Industrial Coating System: <Insert drawing designation.>
 - a. Prime Coat: [Solvent-based bonding primer][Water-based bonding primer] .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, water-based light industrial coating.
 - 1) Gloss and Sheen Level: [Low sheen][Semigloss][Gloss] .
5. Antiviral/Antibacterial Latex System: <Insert drawing designation.>
 - a. Prime Coat: [Interior latex primer sealer][Interior, institutional low-odor/VOC primer sealer][Interior alkyd primer sealer] .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: [Eggshell][Semigloss] .
6. Alkyd System: <Insert drawing designation.>
 - a. Prime Coat: Solvent-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: [Flat][Low sheen][Semigloss][Gloss] .
7. Water-Based Alkyd System: <Insert drawing designation.>
 - a. Prime Coat: [Solvent-based bonding primer][Water-based bonding primer] .

- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based alkyd paint.

1) Gloss and Sheen Level: [**Low sheen**][**Semigloss**][**Gloss**] .

C. Spray-Textured Ceiling Substrates:

1. Latex, Flat System: Spray applied: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: Flat.

2. Latex System: Spray applied: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: [**Flat**][**Low sheen**][**Eggshell**][**Satin**][**Semigloss**][**Gloss**] .

3. Latex over Alkyd Sealer System: **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: [**Flat**][**Low sheen**][**Eggshell**][**Satin**][**Semigloss**][**Gloss**] .

4. Alkyd, Flat System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: Flat.

5. Alkyd over Alkyd Sealer System: **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: [**Flat**][**Low sheen**][**Semigloss**][**Gloss**] .

D. Acoustic Panels and Tiles:

1. Latex, Flat System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: Flat.

2. Latex over Alkyd Sealer System: **<Insert drawing designation.>**

- a. Prime Coat: Interior alkyd primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

3. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, latex, institutional low-odor/VOC paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

4. High-Performance Architectural Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, high-performance architectural latex.

1) Gloss and Sheen Level: **[Low sheen][Eggshell][Satin][Semigloss]** .

5. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**

- a. Prime Coat: **[Interior latex primer sealer][Interior, institutional low-odor/VOC primer sealer][Interior alkyd primer sealer]** .
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex, antiviral/antibacterial coating.

1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .

6. Alkyd, Flat System: **<Insert drawing designation.>**

- a. Prime Coat: Matching topcoat.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior alkyd paint.

1) Gloss and Sheen Level: Flat.

E. Canvas and Cotton Insulation-Covering Substrates: Including **[pipe and duct coverings]<Insert description>** .

1. Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Interior latex primer sealer.
- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior latex paint.

1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .

2. Institutional Low-Odor/VOC Latex System: **<Insert drawing designation.>**

- a. Prime Coat: Interior latex primer sealer.
- b. Intermediate Coat: Matching topcoat.

- c. Topcoat: Interior, latex, institutional low-odor/VOC paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
- 3. Antiviral/Antibacterial Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: **[Interior latex primer sealer][Interior, institutional low-odor/VOC primer sealer][Interior alkyd primer sealer]** .
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex, antiviral/antibacterial coating.
 - 1) Gloss and Sheen Level: **[Eggshell][Semigloss]** .
- 4. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior latex primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
- 5. Aluminum Paint System: **<Insert drawing designation.>**
 - a. Prime Coat: Interior latex primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
- F. Bituminous-Coated Substrates:
 - 1. Latex System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior latex paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Eggshell][Satin][Semigloss][Gloss]** .
 - 2. Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior alkyd paint.
 - 1) Gloss and Sheen Level: **[Flat][Low sheen][Semigloss][Gloss]** .
 - 3. Aluminum Paint System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Aluminum paint.
 - 4. Water-Based Alkyd System: **<Insert drawing designation.>**
 - a. Prime Coat: Water-based, rust-inhibitive primer.
 - b. Intermediate Coat: Matching topcoat.



c. Topcoat: Interior, water-based alkyd paint.

1) Gloss and Sheen Level: [**Low sheen**][**Semigloss**][**Gloss**] .

END OF SECTION 09 91 23 00

SECTION 09 91 23 00A - MULTICOLOR INTERIOR FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of multicolor interior finishing systems[.][**applied on the following substrates:**]
 - 1. Vertical concrete.
 - 2. Cementitious composition board.
 - 3. Clay masonry units.
 - 4. Concrete masonry units (CMU).
 - 5. Wood.
 - 6. Fiberglass moldings and trim.
 - 7. Plastic moldings and trim.
 - 8. Plaster.
 - 9. Gypsum veneer plaster.
 - 10. Gypsum board.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for special-use coatings and general field painting.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and texture specified, **8 inches (200 mm)** square in size.
- D. Samples for Initial Selection: For each multicolor finishing system indicated.
- E. Samples for Verification: For each multicolor finishing system and in each color, pattern, and pigment density indicated.
 - 1. Submit Samples on rigid backing, **8 inches (200 mm)** square.
 - 2. Label each Sample for location and application area.
- F. Product Schedule: For multicolor finishing systems.[**Use same designations indicated on Drawings.**]

1.3 QUALITY ASSURANCE

- A. Mockups: Apply mockup of each coating system indicated to verify preliminary selections made under

Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system and type of substrate.
 - a. Wall Surfaces: Provide mockups of at least **100 sq. ft. (9 sq. m)**.
 - b. Other Items: Architect will designate items or areas required.
2. Apply mockup after permanent lighting and other environmental services have been activated.
3. Final approval of color and pattern selections will be based on mockup.
 - a. If preliminary color and pattern selections are not approved, apply additional mockups of colors and patterns selected by Architect at no added cost to Owner.
4. Repair Mockup: After approval of color and pattern selections, apply representative repairs to **100 sq. in. (645 sq. cm)** of mockup to establish quality standards for coating system repairs.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply coatings until spaces are enclosed and weatherproof, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MULTICOLOR FINISHING SYSTEMS

- A. Master Painters Institute (MPI) Standards: Comply with recommendations in "MPI Architectural Painting Specification Manual" applicable to products and coating systems indicated.
- B. Material Compatibility: Provide materials for use within each coating system that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. VOC Content, LEED 2009: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Clear Wood Finishes, Varnishes: 350 g/L.
 5. Clear Wood Finishes, Lacquers: 550 g/L.
- D. Low-Emitting Materials, LEED 2009: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. VOC Content, LEED v4: For field applications[**that are inside the weatherproofing system**], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Primers, Sealers, and Undercoaters: 100 g/L.
 4. Clear Wood Finishes, Varnishes: 275 g/L.
 5. Clear Wood Finishes, Lacquers: 275 g/L.
- F. Low-Emitting Materials, LEED v4: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Material Emissions and Pollutant Control: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Nonflat - High-Gloss Coatings: 150 g/L.
 - d. Primers, Sealers, and Undercoaters: 100 g/L.
- H. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoats: 100 g/L.
 - d. Clear Wood Finishes (Varnishes, Sanding Sealers, and Lacquers): 275 g/L.
- I. VOC Content: For field applications inside the building, wall paints shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Interior Flat Latex Wall Paint: 50 g/L.
2. Interior Nonflat Latex Wall Paint: 150 g/L.

- J. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- K. Colors and Patterns: **[Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated in finish schedule]<Insert requirements>.**

2.2 MULTICOLOR COATINGS

- A. Multicolor Coating: Water- or solvent-based coat that provides a decorative polychromatic finish.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Crafton Coatings; Bollen International]**
 - b. **[Multicolor Specialties, Inc]**
 - c. **[Seagrave Coatings Corp]**
 - d. **[Zolatone; Master Coating Technologies; ICP Group]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crafton Coatings; Bollen International]**
 - b. **[Multicolor Specialties, Inc]**
 - c. **[Seagrave Coatings Corp]**
 - d. **[Zolatone; Master Coating Technologies; ICP Group]**
 - e. **<Insert manufacturer's name>**
- B. Clear Topcoat: Water-based, clear acrylic co-polymer emulsion or solvent-based, clear acrylic solution binder product recommended by multicolor coating manufacturer for use in multicolor coating system indicated to add surface abrasion and detergent resistance.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Benjamin Moore & Co.]**
 - b. **[Coronado Paint; Benjamin Moore & Co.]**
 - c. **[Multicolor Specialties, Inc]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Benjamin Moore & Co.]**
- b. **[Coronado Paint; Benjamin Moore & Co.]**
- c. **[Multicolor Specialties, Inc]**
- d. **[Sherwin-Williams Company (The)]**
- e. **<Insert manufacturer's name>**

2.3 FILLERS AND PRIMERS

- A. Fillers, sealers, and primers recommended in writing for use in coating systems by manufacturer of multicolor interior coating on substrates and under conditions indicated.
- B. Latex Block Filler: Waterborne, high-solids, emulsion-type, pigmented coating product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, with bridging and filling properties, and formulated for filling surfaces of CMU for subsequent applications of finish coatings.
- C. Wood Filler Paste: Solvent-based, high-solids, clear paste product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, for use on open-grained or damaged woods. The paste fills hardwood pores with minimal surface residues and without showing cracking or shrinkage. Sanding dried filler produces a smooth surface without clogging or gumming sandpaper.
- D. Wood-Knot Sealer: White shellac or other sealer recommended in writing for this purpose by manufacturer of multicolor interior coating.
- E. Primer/Sealer for Multicolor Systems: Acrylic or acrylic/polyvinyl acetate (PVA) co-polymer emulsion-type, pigmented primer/sealer product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating.
- F. Interior Alkyd Primer/Sealer: Solvent-based, pigmented primer/sealer.
- G. Water-Based Bonding Primer: Water-based, emulsion-type, pigmented primer product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, and formulated to promote adhesion of subsequent coatings.
- H. Solvent-Based Bonding Primer: Solvent-based, pigmented product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, and formulated to promote adhesion of subsequent coatings to substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of coatings.
 - 1. Maximum Moisture Content of Substrates: 12 percent, measured with an electronic moisture meter.
 - 2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

3. Plaster Substrates: Verify that plaster is fully cured.
4. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
5. Begin coating application only after unsatisfactory conditions have been corrected.
6. Beginning coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible primers, paints, and encapsulants.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content of surfaces or if alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Wood Substrates:
 1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view; remove sanding dust from surfaces to be coated.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried and remove sanding dust.

3.3 APPLICATION

- A. Apply coatings according to manufacturer's written instructions using applicators and techniques suited for coating and substrate indicated.
- B. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
- C. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- D. Apply coating systems to produce uniformly textured, colored, and patterned finished-surface films without substrates, undercoats, marks, or stains showing through. Produce sharp, even glass lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel in proper applicators and techniques for repairing multicolored interior coating systems on substrates indicated.

3.6 MULTICOLOR INTERIOR FINISHING SCHEDULE

- A. Vertical Concrete Substrates:
 - 1. Prime Coat: Primer/sealer for multicolor systems.
 - 2. Multicolor Base Coat: Multicolor coating.
 - 3. Multicolor Pattern Coat: Multicolor coating.
 - 4. Topcoat: Clear topcoat.
- B. Cementitious Composition Board Substrates:
 - 1. Prime Coat: Primer/sealer for multicolor systems.
 - 2. Multicolor Base Coat: Multicolor coating.
 - 3. Multicolor Pattern Coat: Multicolor coating.
 - 4. Topcoat: Clear topcoat.
- C. Clay Masonry Unit Substrates:
 - 1. Prime Coat: Primer/sealer for multicolor systems tinted to match multicolor basecoat.
 - 2. Multicolor Base Coat: Multicolor coating.
 - 3. Multicolor Pattern Coat: Multicolor coating.
 - 4. Topcoat: Clear topcoat.
- D. CMU Substrates:
 - 1. Block Filler: Latex block filler.
 - 2. Prime Coat: Primer/sealer for multicolor systems.
 - 3. Multicolor Base Coat: Multicolor coating.
 - 4. Multicolor Pattern Coat: Multicolor coating.
 - 5. Topcoat: Clear topcoat.
- E. Wood Substrates:
 - 1. Fill Coat: Wood filler paste.

2. Prime Coat: Interior alkyd primer/sealer[**tinted to match multicolor base coat**].
3. Multicolor Base Coat: Multicolor coating.
4. Multicolor Pattern Coat: Multicolor coating.
5. Topcoat: Clear topcoat.

F. Fiberglass Molding and Trim Substrates:

1. Prime Coat: **[Water][Solvent]**-based bonding primer.
2. Multicolor Base Coat: Multicolor coating.
3. Multicolor Pattern Coat: Multicolor coating.
4. Topcoat: Clear topcoat.

G. Plastic Molding and Trim Substrates:

1. Prime Coat: Solvent-based bonding primer.
2. Multicolor Base Coat: Multicolor coating.
3. Multicolor Pattern Coat: Multicolor coating.
4. Topcoat: Clear topcoat.

H. Gypsum Board Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating.
3. Multicolor Pattern Coat: Multicolor coating.
4. Topcoat: Clear topcoat.

I. Plaster Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating.
3. Multicolor Pattern Coat: Multicolor coating.
4. Topcoat: Clear topcoat.

J. Gypsum Veneer Plaster Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating.
3. Multicolor Pattern Coat: Multicolor coating.
4. Topcoat: Clear topcoat.

END OF SECTION 09 91 23 00A



Task	Specification	Specification Description
09 91 23 00	09 91 13 00	Exterior Painting
09 91 33 00	09 93 00 00	Staining and Transparent Finishing
09 91 33 00	09 91 13 00a	High-Temperature-Resistant Coatings



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SECTION 09 93 00 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Primers
2. Wood stains.
3. Transparent finishes.

B. Related Requirements:

1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.
2. Section 099600 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

1. Size: **[8 inches (200 mm) square][or][8 inches (200 mm) long]**.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

E. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
3. Environmental Product Declaration: For each product.
4. Health Product Declaration: For each product.
5. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
6. Environmental Product Declaration: For each product.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.

9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Stains and Transparent Finishes: **[5]<Insert number>** percent, but not less than **[1 gal. (3.8 L)]<Insert number>** of each material and color applied.

1.4 MOCKUPS

- A. Apply mockups of each finish system indicated and each color selected **[to verify preliminary selections made under Sample submittals][to demonstrate aesthetic effects][and][to set quality standards for materials and execution]**.
 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft. (9 sq. m)**.
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than **5 deg F (3 deg C)** above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.2 STAINING AND TRANSPARENT FINISHING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Behr Paint Company (Behr Process LLC)]**
2. **[Benjamin Moore & Co.]**
3. **[Coronado Paint; Benjamin Moore & Co.]**
4. **[Diamond Vogel Paint Company]**
5. **[Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]**
6. **[Hempel (USA), Inc.]**
7. **[Lenmar Lacquers; Benjamin Moore & Co.]**
8. **[PPG Paints; PPG Industries, Inc.]**
9. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
10. **[Rodda Paint Co.]**
11. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
12. **[Sherwin-Williams Company (The)]**
13. **[United Gilsonite Laboratories (UGL)]**
14. **[Vista Paint Corporation]**
15. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Behr Paint Company (Behr Process LLC)]**
2. **[Benjamin Moore & Co.]**
3. **[Coronado Paint; Benjamin Moore & Co.]**
4. **[Diamond Vogel Paint Company]**
5. **[Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]**
6. **[Hempel (USA), Inc.]**
7. **[Lenmar Lacquers; Benjamin Moore & Co.]**
8. **[PPG Paints; PPG Industries, Inc.]**
9. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
10. **[Rodda Paint Co.]**
11. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
12. **[Sherwin-Williams Company (The)]**
13. **[United Gilsonite Laboratories (UGL)]**
14. **[Vista Paint Corporation]**
15. **<Insert manufacturer's name>**

- C. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

- D. VOC Content, LEED 2009: For field applications that are inside the weatherproofing system, paints and

coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Clear Wood Finishes, Varnishes: 350 g/L.
 2. Clear Wood Finishes, Lacquers: 550 g/L.
 3. Shellacs, Clear: 730 g/L.
 4. Stains: 250 g/L.
- E. Low-Emitting Materials, LEED 2009: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. VOC Content, LEED v4: For field applications[**that are inside the weatherproofing system**], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Primers, Sealers, and Undercoaters: 100 g/L.
 2. Clear Wood Finishes, Varnishes: 275 g/L.
 3. Clear Wood Finishes, Lacquers: 275 g/L.
 4. Shellacs, Clear: 730 g/L.
 5. Stains: 100 g/L.
- G. Low-Emitting Materials, LEED v4: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Material Emissions and Pollutant Control: Not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system shall comply with the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
- I. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Shellacs, Clear: 730 g/L.
 - b. Stains: 250 g/L.
 - c. Clear Wood Finishes (Varnishes, Sanding Sealers, and Lacquers): 275 g/L.
- J. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- K. Stain Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule]<Insert requirements>.**

2.3 PRIMERS

- A. Primer, Alkyd Oil for Exterior Wood: Alkyd/oil-based primer for exterior wood with resistance to bleeding.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Benjamin Moore & Co.]**
 - b. **[Diamond Vogel Paint Company]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Benjamin Moore & Co.]**
 - b. **[Diamond Vogel Paint Company]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **<Insert manufacturer's name>**

- B. Primer, Latex for Exterior Wood: Pigmented, water-borne, emulsion-type primer for exterior wood surfaces.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]**
 - e. **[PPG Paints; PPG Industries, Inc.]**
 - f. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - g. **[Rodda Paint Co.]**
 - h. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - i. **[Sherwin-Williams Company (The)]**
 - j. **[Vista Paint Corporation]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:



- a. [Behr Paint Company (Behr Process LLC)]
 - b. [Benjamin Moore & Co.]
 - c. [Diamond Vogel Paint Company]
 - d. [Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]
 - e. [PPG Paints; PPG Industries, Inc.]
 - f. [Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]
 - g. [Rodda Paint Co.]
 - h. [Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]
 - i. [Sherwin-Williams Company (The)]
 - j. [Vista Paint Corporation]
 - k. <Insert manufacturer's name>

- C. Preservative for Exterior Wood: Solvent-based, penetrating anti-fungal treatment for exterior wood consisting mainly of zinc or copper naphthenate.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]
 - b. <Insert manufacturer's name>

 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]
 - b. <Insert manufacturer's name>

- D. Alkyd Sanding Sealer, Interior, Solvent Based, Clear: Solvent-based, quick-drying, clear, sandable alkyd sealer used on new interior wood surfaces that are to be top-coated with an alkyd varnish.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [PPG Paints; PPG Industries, Inc.]
 - b. [Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]
 - c. [Rodda Paint Co.]
 - d. [Sherwin-Williams Company (The)]
 - e. <Insert manufacturer's name>

 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [PPG Paints; PPG Industries, Inc.]
 - b. [Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]
 - c. [Rodda Paint Co.]
 - d. [Sherwin-Williams Company (The)]
 - e. <Insert manufacturer's name>

2.4 WOOD STAINS

- A. Stain, Exterior, Solvent Based, Semitransparent: Solvent-based, oil or oil/alkyd, semitransparent, pigmented stain for new wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Rodda Paint Co.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Rodda Paint Co.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **<Insert manufacturer's name>**
- B. Stain, Exterior, Solvent Based, Solid Hide: Solvent-based, oil or oil/alkyd, pigmented stain for new, or previously stained, wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Diamond Vogel Paint Company]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Diamond Vogel Paint Company]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
- C. Stain, Exterior, Water Based, Solid Hide: Water-based, solid-hide, emulsion-type, pigmented stain for primed or previously painted exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Diamond Vogel Paint Company]
- d. [Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]
- e. [PPG Paints; PPG Industries, Inc.]
- f. [Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]
- g. [Sherwin-Williams Company (The)]
- h. [Vista Paint Corporation]
- i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Diamond Vogel Paint Company]
- d. [Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company)]
- e. [PPG Paints; PPG Industries, Inc.]
- f. [Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]
- g. [Sherwin-Williams Company (The)]
- h. [Vista Paint Corporation]
- i. <Insert manufacturer's name>

- D. Stain, Exterior, Water Based, Semitransparent: Water-based, semitransparent, pigmented stain for new wood surfaces.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Coronado Paint; Benjamin Moore & Co.]
- d. [PPG Paints; PPG Industries, Inc.]
- e. [Sherwin-Williams Company (The)]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Behr Paint Company (Behr Process LLC)]
- b. [Benjamin Moore & Co.]
- c. [Coronado Paint; Benjamin Moore & Co.]
- d. [PPG Paints; PPG Industries, Inc.]
- e. [Sherwin-Williams Company (The)]
- f. <Insert manufacturer's name>

- E. Stain, Exterior, for Wood Decks: Solvent- or water- based, modified-oil or alkyd-type, semitransparent, penetrating stain for exterior dimensional wood decking.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - f. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Diamond Vogel Paint Company]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - f. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **<Insert manufacturer's name>**
- F. Stain, Interior, Semitransparent, for Interior Wood: Solvent-based, oil or oil/alkyd, semitransparent, pigmented stain for new interior wood surfaces that are to be finished with a clear varnish.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[PPG Paints; PPG Industries, Inc.]**
 - c. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - d. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[PPG Paints; PPG Industries, Inc.]**
 - c. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - d. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **<Insert manufacturer's name>**
- G. Shellac: Alcohol-based, shellac type, clear or light amber-colored coating for use as a sealer on stains and knots or as a wash coat to even the porosity of some wood types.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**

H. Danish Oil: Solvent-based, oil-type, penetrating stain for application by brush or wiping on interior wood surfaces.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**

2.5 TRANSPARENT FINISHES

A. Varnish, Marine Spar, Exterior, Gloss: Solvent-based, phenolic-modified clear varnish for exterior wood surfaces.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**

3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- B. Varnish with UV Inhibitor, Exterior, Gloss: Solvent-based, alkyd-type, clear gloss varnish stabilized against UV deterioration for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- C. Varnish with UV Inhibitor, Exterior, Semigloss: Solvent-based, alkyd-type, clear semigloss varnish stabilized against UV deterioration for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard semigloss finish][Gloss of 35 to 70 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- D. Varnish, Exterior, Aliphatic Polyurethane, Two Component: Solvent-based, two-component, aliphatic polyurethane clear coating used on exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hempel (USA), Inc.]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hempel (USA), Inc.]**
 - b. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of minimum 80 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- E. Varnish, Exterior, Water Based, Eggshell: Water-based clear varnish for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: Gloss and Sheen Level: **[Manufacturer's standard eggshell finish][Gloss of 10 to 25 units at 60 degrees and sheen of 10 to 35 units at 85 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- F. Varnish, Exterior, Water Based, Satin: Water-based clear varnish for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: **[Manufacturer's standard low-sheen finish][Gloss of 20 to 35 units at 60 degrees and minimum sheen of 35 units at 85 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- G. Varnish, Exterior, Water Based, Semigloss: Water-based clear varnish for exterior wood surfaces.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard semigloss finish][Gloss of 35 to 70 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- H. Varnish, Exterior, Water Based, Gloss: Water-based clear varnish for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- I. Varnish, Exterior, Water Based, High Gloss: Water-based clear varnish for exterior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**

- b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of minimum 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- J. Varnish, Interior Polyurethane, Moisture Cured, Gloss: Solvent-based, moisture-curing polyurethane clear-coating with a gloss finish for interior wood surfaces,
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Benjamin Moore & Co.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Benjamin Moore & Co.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- K. Varnish, Interior, Polyurethane, Oil Modified, Gloss: Solvent-based, one-component, oil-modified polyurethane clear gloss varnish for new or previously varnished or stained interior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **[United Gilsonite Laboratories (UGL)]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**

- f. **[Sherwin-Williams Company (The)]**
 - g. **[United Gilsonite Laboratories (UGL)]**
 - h. **<Insert manufacturer's name>**
 - 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- L. Varnish, Interior, Polyurethane, Oil Modified, Satin: Solvent-based, one-component, oil-modified polyurethane clear satin varnish for new or previously varnished or stained interior wood surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **[United Gilsonite Laboratories (UGL)]**
 - h. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Rodda Paint Co.]**
 - e. **[Rust-Oleum Corporation; a subsidiary of RPM International, Inc.]**
 - f. **[Sherwin-Williams Company (The)]**
 - g. **[United Gilsonite Laboratories (UGL)]**
 - h. **<Insert manufacturer's name>**
 - 3. Gloss and Sheen Level: **[Manufacturer's standard low-sheen finish][Gloss of 20 to 35 units at 60 degrees and minimum sheen of 35 units at 85 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- M. Varnish, Interior, Flat/Satin: Solvent-based, alkyd-type, clear flat/satin varnish for new or properly prepared, previously varnished interior wood surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

-
- a. **[Sherwin-Williams Company (The)]**
 - b. **<Insert manufacturer's name>**
 3. Gloss and Sheen Level: **[Manufacturer's standard flat finish][Maximum gloss of 5 units at 60 degrees and maximum sheen of 10 units at 85 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- N. Varnish, Interior, Gloss: Solvent-based, alkyd-type, clear gloss varnish for new or properly prepared, previously varnished interior wood surfaces.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[PPG Paints; PPG Industries, Inc.]**
 - b. **[Sherwin-Williams Company (The)]**
 - c. **<Insert manufacturer's name>**
 3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of 70 to 85 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- O. Varnish, Interior, Water Based, Clear, Satin: Water-based clear satin coating for interior wood trim, frames, doors, paneling and cabinetry.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - d. **[PPG Paints; PPG Industries, Inc.]**
 - e. **[Sherwin-Williams Company (The)]**
 - f. **<Insert manufacturer's name>**

3. Gloss and Sheen Level: **[Manufacturer's standard low-sheen finish][Gloss of 20 to 35 units at 60 degrees and minimum sheen of 35 units at 85 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- P. Varnish, Interior, Water Based, Clear, Semigloss: Water-based clear semigloss coating for interior wood trim, frames, doors, paneling and cabinetry.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[Benjamin Moore & Co.]**
 - b. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Benjamin Moore & Co.]**
 - b. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **<Insert manufacturer's name>**
3. Gloss Level: **[Manufacturer's standard semigloss finish][Gloss of 35 to 70 units at 60 degrees when tested in accordance with ASTM D523]<Insert requirements>**.
- Q. Varnish, Interior, Water Based, Clear, High Gloss: Water-based clear high-gloss coating for interior wood trim, frames, doors, paneling and cabinetry.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[Benjamin Moore & Co.]**
 - b. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Benjamin Moore & Co.]**
 - b. **[Lenmar Lacquers; Benjamin Moore & Co.]**
 - c. **[PPG Paints; PPG Industries, Inc.]**
 - d. **[Sherwin-Williams Company (The)]**
 - e. **<Insert manufacturer's name>**
3. Gloss Level: **[Manufacturer's standard gloss finish][Gloss of minimum 85 units at 60**

degrees when tested in accordance with ASTM D523]<Insert requirements>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: [15][13][10][9] percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- C. Exterior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Prime edges, ends, faces, undersides, and backsides of wood.
 - a. For solid hide stained wood, stain edges and ends after priming.
 - b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
 - 3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

D. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, Glued-Laminated Construction:

1. Solid-Color, Solvent-Based Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, solvent based, solid hide.
2. Varnish over Semitransparent Stain System :
 - a. Stain Coat: Stain, exterior, solvent based, semitransparent.
 - b. First Intermediate Coat: Varnish matching topcoat.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, with UV inhibitor, exterior, [**semigloss**][**gloss**][**high gloss**].
3. Water-Based Varnish System :

- a. Prime Coat: Water-based varnish matching topcoat.
- b. Intermediate Coat: Water-based varnish matching topcoat.
- c. Topcoat: Water-based varnish, **[eggshell][satin][semigloss][gloss][high gloss]**.

4. Varnish System :

- a. Prime Coat: Varnish matching topcoat.
- b. First Intermediate Coat: Varnish matching topcoat.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, with UV inhibitor, exterior, **[semigloss][gloss][high gloss]**.

5. Clear, Two-Component Polyurethane Varnish over Stain System :

- a. Stain Coat: Stain, exterior, solvent based, semitransparent.
- b. First Intermediate Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
- c. Second Intermediate Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
- d. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.

6. Clear, Two-Component Polyurethane Varnish System :

- a. Prime Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
- b. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.

B. Wood Substrates, Exposed Framing:

1. Solid-Color, Water-Based Stain System :

- a. Prime Coat: Primer, alkyd for exterior wood.
- b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
- c. Topcoat: Stain, exterior, water based, solid hide.

2. Solid-Color, Solvent-Based Stain System :

- a. Prime Coat: Primer, alkyd for exterior wood.
- b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
- c. Topcoat: Stain, exterior, solvent based, solid hide.

3. Water-Based Semitransparent Stain System :

- a. Prime Coat: Stain, exterior, water based, semitransparent, matching topcoat.
- b. Intermediate Coat: Stain, exterior, water based, semitransparent, matching topcoat.
- c. Topcoat: Stain, exterior, water based, semitransparent.

4. Semitransparent Stain System :

- a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
- b. Topcoat: Stain, exterior, solvent based, semitransparent.

5. Varnish over Stain System :

- a. Stain Coat: Stain, exterior, solvent based, semitransparent.
- b. First Intermediate Coat: Varnish matching topcoat.
- c. Second Intermediate Coat: Varnish matching topcoat.

- d. Topcoat: Varnish, with UV inhibitor, exterior, [**semigloss**][**gloss**][**high gloss**].
- 6. Water-Based Varnish System :
 - a. Prime Coat: Water-based varnish matching topcoat.
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Water-based varnish, [**eggshell**][**satin**][**semigloss**][**gloss**][**high gloss**].
- 7. Varnish System :
 - a. Prime Coat: Varnish matching topcoat.
 - b. First Intermediate Coat: Varnish matching topcoat.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, with UV inhibitor, exterior, [**semigloss**][**gloss**][**high gloss**].
- 8. Clear, Two-Component Polyurethane Varnish System :
 - a. Prime Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
 - b. Intermediate Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two component, [**gloss**][**high gloss**].
- C. Wood Substrates, [**Wood Trim**][**Architectural woodwork**][**Doors**][**Windows**][**Wood Board Siding**][**and**][**Wood Fences**]:
 - 1. Solid-Color, Water-Based Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, solid hide.
 - 2. Solid-Color, Solvent-Based Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, solvent based, solid hide.
 - 3. Water-Based Semitransparent Stain System :
 - a. Prime Coat: Stain, exterior, water based, semitransparent, matching topcoat.
 - b. Intermediate Coat: Stain, exterior, water based, semitransparent, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, semitransparent.
 - 4. Semitransparent Stain System :
 - a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semitransparent.
 - 5. Varnish over Stain System :
 - a. Stain Coat: Stain, exterior, solvent-based, semitransparent.
 - b. First Intermediate Coat: Varnish matching topcoat.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, with UV inhibitor, exterior, [**semigloss**][**gloss**][**high gloss**].
 - 6. Water-Based Varnish System :

- a. Prime Coat: Water-based varnish matching topcoat.
- b. Intermediate Coat: Water-based varnish matching topcoat.
- c. Topcoat: Water-based varnish, **[eggshell][satin][semigloss][gloss][high gloss]**.

7. Varnish System :

- a. Prime Coat: Varnish matching topcoat.
- b. First Intermediate Coat: Varnish matching topcoat.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, with UV inhibitor, exterior, **[semigloss][gloss][high gloss]**.

8. Clear, Two-Component Polyurethane Varnish System :

- a. Prime Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
- b. Topcoat: Varnish, aliphatic polyurethane, two component gloss.

D. Wood Substrates, Wood-Based Panel Products:

1. Solid-Color, Water-Based Stain System :

- a. Prime Coat: Primer, **[latex][alkyd]** for exterior wood.
- b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
- c. Topcoat: Stain, exterior, water based, solid hide.

2. Solid-Color, Solvent-Based Stain System :

- a. Prime Coat: Primer, alkyd for exterior wood.
- b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
- c. Topcoat: Stain, exterior, solvent based, solid hide.

3. Water-Based Semitransparent Stain System :

- a. Prime Coat: Stain, exterior, water based, semitransparent, matching topcoat.
- b. Intermediate Coat: Stain, exterior, water based, semitransparent, matching topcoat.
- c. Topcoat: Stain, exterior, water based, semitransparent.

4. Semitransparent Stain System :

- a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
- b. Topcoat: Stain, exterior, solvent based, semitransparent.

5. Varnish over Stain System :

- a. Stain Coat: Stain, exterior, solvent based, semitransparent.
- b. First Intermediate Coat: Varnish matching topcoat.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, with UV inhibitor, exterior, **[semigloss][gloss][high gloss]**.

6. Varnish System :

- a. Prime Coat: Varnish matching topcoat.
- b. First Intermediate Coat: Varnish matching topcoat.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, with UV inhibitor, exterior, **[semigloss][gloss][high gloss]**.

E. Wood Substrates, Traffic Surfaces, Including [**Lumber Decking**][and][**Stairs**]:

1. Deck Stain over Wood Preservative System :
 - a. Preservative Coat: Preservative, for exterior wood.
 - b. Intermediate Coat: Stain, for exterior wood decks, matching topcoat.
 - c. Topcoat: Stain, for exterior wood decks.
2. Deck Stain System :
 - a. Prime Coat: Stain, for exterior wood decks, matching topcoat.
 - b. Topcoat: Stain, for exterior wood decks.

F. Wood Substrates, Wood Shingles and Shakes (Excluding Roofs):

1. Solid-Color, Water-Based Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, solid hide.
2. Solid-Color, Solvent-Based Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, solvent based, solid hide.
3. Semitransparent Stain System :
 - a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semitransparent.

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, Glued-Laminated Construction:

1. Solid-Color Latex Stain System :
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, solid hide.
2. Solid-Color, Solvent-Based Stain System :
 - a. Prime Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, solid hide.
3. Semitransparent Stain System :
 - a. Prime Coat: Stain, semitransparent, matching topcoat.
 - b. Topcoat: Stain, semitransparent, for interior wood.
4. Water-Based Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Second Intermediate Coat: Water-based varnish matching topcoat.
 - d. Topcoat: Varnish, water based, clear, [satin][semigloss][gloss].
5. Water-Based Varnish System :
 - a. Prime Coat: Water-based varnish matching topcoat.
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, [satin][semigloss][gloss].
6. Alkyd Varnish over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: [Varnish matching topcoat][Alkyd, sanding sealer, clear].
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, interior, [flat][gloss].
7. Alkyd Varnish System :
 - a. Prime Coat: Alkyd, sanding sealer, clear.
 - b. Intermediate Coat: Varnish matching topcoat.
 - c. Topcoat: Varnish, interior, [flat][gloss].
8. Polyurethane Varnish over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil modified, [satin][gloss].
9. Polyurethane Varnish System :
 - a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil modified, [satin][gloss].
10. Moisture-Cured Clear Polyurethane over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - d. Topcoat: Varnish, polyurethane, moisture cured, gloss.
11. Clear, Two-Component Polyurethane System :
 - a. Prime Coat: Two-component polyurethane matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.

B. Wood Substrates, Exposed Framing:

1. Water-Based Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Second Intermediate Coat: Water-based varnish matching topcoat.
 - d. Topcoat: Varnish, water based, clear, **[satin][semigloss][gloss]**.
2. Alkyd Varnish over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Alkyd, sanding sealer, clear.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, interior, **[flat][gloss]**.
3. Alkyd Varnish System :
 - a. Prime Coat: Alkyd, sanding sealer, clear.
 - b. Intermediate Coat: Varnish matching topcoat.
 - c. Topcoat: Varnish, interior, **[flat][gloss]**.
4. Polyurethane Varnish over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.
5. Polyurethane Varnish System :
 - a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.
6. Moisture-Cured Clear Polyurethane over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - d. Topcoat: Varnish, polyurethane, moisture cured, gloss.
7. Clear, Two-Component Polyurethane System :
 - a. Prime Coat: Two-component polyurethane matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.
- C. Wood Substrates, **[Wood Trim][Architectural Woodwork][Doors][Windows][and][Wood Board Paneling]**:
 1. Semitransparent Stain System :
 - a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semitransparent.
 2. Water-Based Varnish over Stain System :
 - a. Stain Coat: Stain, semitransparent, for interior wood.

- b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Second Intermediate Coat: Water-based varnish matching topcoat.
 - d. Topcoat: Varnish, water based, clear, **[satin][semigloss][gloss]**.
3. Water-Based Varnish System :
- a. Prime Coat: Water-based varnish matching topcoat.
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, **[satin][semigloss][gloss]**.
4. Alkyd Varnish over Stain System :
- a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: **[Alkyd, sanding sealer, clear][Shellac, clear]**.
 - c. Second Intermediate Coat: Varnish matching topcoat.
 - d. Topcoat: Varnish, interior, **[flat][gloss]**.
5. Alkyd Varnish System :
- a. Prime Coat: **[Alkyd, sanding sealer, clear][Shellac, clear]**.
 - b. Intermediate Coat: Varnish matching topcoat.
 - c. Topcoat: Varnish, interior, **[flat][gloss]**.
6. Polyurethane Varnish over Stain System :
- a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.
7. Polyurethane Varnish System :
- a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.
8. Moisture-Cured Clear Polyurethane over Stain System :
- a. Stain Coat: Stain, semitransparent, for interior wood.
 - b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - d. Topcoat: Varnish, polyurethane, moisture cured, gloss.
9. Moisture-Cured Clear Polyurethane System :
- a. Prime Coat: Moisture-cured polyurethane matching topcoat.
 - b. Intermediate Coat: Moisture-cured polyurethane matching topcoat.
 - c. Topcoat: Varnish, polyurethane, moisture cured, gloss.
10. Clear, Two-Component Polyurethane System :
- a. Prime Coat: Two-component polyurethane matching topcoat.
 - b. Intermediate Coat: Two-component polyurethane matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.

11. Danish Oil System :

- a. Prime Coat: Danish oil matching topcoat.
- b. Topcoat: Danish oil.

D. Wood Substrates, **[Wood Paneling][and][Casework]**:

1. Semitransparent Stain System :

- a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
- b. Topcoat: Stain, exterior, solvent based, semitransparent.

2. Water-Based Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: Water-based varnish matching topcoat.
- c. Second Intermediate Coat: Water-based varnish matching topcoat.
- d. Topcoat: Varnish, water based, clear, **[satin][semigloss][gloss]**.

3. Water-Based Varnish System :

- a. Prime Coat: Water-based varnish matching topcoat.
- b. Intermediate Coat: Water-based varnish matching topcoat.
- c. Topcoat: Varnish, water based, clear, **[satin][semigloss][gloss]**.

4. Alkyd Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: **[Alkyd, sanding sealer, clear][Shellac, clear]**.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, interior, **[flat][gloss]**.

5. Alkyd Varnish System :

- a. Prime Coat: Alkyd, sanding sealer, clear **[Shellac, clear]**.
- b. Intermediate Coat: Varnish matching topcoat.
- c. Topcoat: Varnish, interior, **[flat][gloss]**.

6. Polyurethane Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
- d. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.

7. Polyurethane Varnish System :

- a. Prime Coat: Polyurethane varnish matching topcoat.
- b. Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Topcoat: Varnish, interior, polyurethane, oil modified, **[satin][gloss]**.

8. Moisture-Cured Clear Polyurethane over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.

- c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
- d. Topcoat: Varnish, polyurethane, moisture cured, gloss.

9. Danish Oil System :

- a. Prime Coat: Danish oil matching topcoat.
- b. Topcoat: Danish oil.

E. Wood Substrates, Traffic Surfaces, Including **[Floors][and][Stairs]**:

1. Polyurethane Varnish over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
- d. Topcoat: Varnish, interior, polyurethane, oil modified, gloss.

2. Polyurethane Varnish System :

- a. Prime Coat: Polyurethane varnish matching topcoat.
- b. Intermediate Coat: Polyurethane varnish matching topcoat.
- c. Topcoat: Varnish, interior, polyurethane, oil modified, gloss.

3. Moisture-Cured Clear Polyurethane over Stain System :

- a. Stain Coat: Stain, semitransparent, for interior wood.
- b. First Intermediate Coat: Moisture-cured polyurethane matching topcoat.
- c. Second Intermediate Coat: Moisture-cured polyurethane matching topcoat.
- d. Topcoat: Varnish, polyurethane, moisture cured, gloss.

4. Moisture-Cured Clear Polyurethane System :

- a. Prime Coat: Moisture-cured polyurethane matching topcoat.
- b. Intermediate Coat: Moisture-cured polyurethane matching topcoat.
- c. Topcoat: Varnish, polyurethane, moisture cured, gloss.

5. Clear, Two-Component Polyurethane System :

- a. Prime Coat: Two-component polyurethane matching topcoat.
- b. Intermediate Coat: Two-component polyurethane matching topcoat.
- c. Topcoat: Varnish, aliphatic polyurethane, two component, gloss.

F. Wood Substrates, Wood Shingles and Shakes:

1. Solid-Color Latex Stain System :

- a. Prime Coat: Primer, latex for exterior wood.
- b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
- c. Topcoat: Stain, exterior, water based, solid hide.

2. Solid-Color, Solvent-Based Stain System :

- a. Prime Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
- b. Topcoat: Stain, exterior, solvent based, solid hide.



3. Semitransparent Stain System :
 - a. Prime Coat: Stain, semitransparent, matching topcoat.
 - b. Topcoat: Stain, semitransparent, for interior wood.

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Task	Specification	Specification Description
09 93 13 00	09 93 00 00	Staining and Transparent Finishing
09 93 13 53	09 93 00 00	Staining and Transparent Finishing
09 93 23 00	09 93 00 00	Staining and Transparent Finishing
09 93 23 13	09 93 00 00	Staining and Transparent Finishing
09 93 23 53	09 93 00 00	Staining and Transparent Finishing



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SECTION 09 96 00 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Block fillers.
2. Interior primers/sealers.
3. Metal primers.
4. Epoxy coatings.
5. Polyurethane coatings.

B. Related Requirements:

1. **[Section 051200 "Structural Steel Framing"] [Section 051213 "Architecturally Exposed Structural Steel Framing"]** for shop priming structural steel substrates with primers specified in this Section.
2. Section 055213 "Pipe and Tube Railings" for shop **[priming] [painting]** pipe and tube railings with coatings specified in this Section.
3. Section 099113 "Exterior Painting" for general field painting.
4. Section 099123 "Interior Painting" for general field painting.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of coating system and each color and gloss of topcoat. Submit **[actual paint drawdowns as specified below] [paint manufacturer's standard printed cards]** for verification Samples.

1. Submit Samples on actual substrate material to be coated, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in High-Performance Coating Schedules. Include color designations and production runs (batch numbers).

F. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for paints and coatings.>

2. <Double click to insert sustainable design text for EPDs and HPDs.>

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same production run (batch number),**] that match coating system products applied and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Coatings: **[5] <Insert number>** percent, but not less than **[1 gal. (3.8 L)] <Insert value>** of each material and color applied.

1.4 MOCKUPS

- A. Apply mockups of each coating system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.
 3. **<Insert requirements>**.

1.6 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each coating system product from single source from single manufacturer.

2.2 HIGH-PERFORMANCE COATING PRODUCTS, GENERAL

- A. High-Performance Coating Products: Subject to compliance with requirements, **[provide product]** **[provide one of the products]** **[available products that may be incorporated into the Work include but are not limited to products]** listed in product types below and applicable exterior and interior high-performance coating schedule articles for the coating category indicated.
- B. Material Compatibility:
 - 1. Materials for use within each coating system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
 - 2. For each coat in a coating system, provide products recommended in writing by topcoat manufacturer for use in system and on substrate indicated.
- C. <Double click to insert sustainable design text for coatings.>
- D. Colors: **[As selected by Architect from manufacturer's full range]** **[Match Architect's samples]** **[As indicated in color schedule on Drawings]** **<Insert requirements>**.

2.3 BLOCK FILLERS

- A. Latex Block Filler: Water-based, pigmented, high-solids, emulsion coating formulated to bridge and fill porous surfaces of CMU substrates in preparation for specified subsequent coatings.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Epoxy Block Filler: Solvent-based, two-component, epoxy, high-solids coating; formulated to bridge and fill porous surfaces of CMU substrates in preparation for specified subsequent coatings.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.4 INTERIOR PRIMERS/SEALERS

- A. Interior Latex Primer Sealer: Pigmented, water-based latex sealer; formulated to reduce porosity of substrate for finish coats; for use on new interior plaster, concrete, and gypsum board substrates. Not intended for use on wood or previously painted surfaces.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Wood-Knot Sealer: White shellac or other sealer recommended in writing by manufacturer for this purpose.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.5 METAL PRIMERS

- A. Zinc-Rich Inorganic Primer: Corrosion-resistant, inorganic-based, zinc-rich primer; formulated for use on prepared ferrous metal substrates that will be exposed to severe industrial or marine environments.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Epoxy Zinc-Rich Primer: Solvent-based, multi-component, epoxy-type anti-corrosive primer; formulated for use on cleaned ferrous metal substrates that will be exposed to moderate industrial or marine environments.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Water-Based, Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer; formulated for resistance to flash rusting when applied to cleaned, ferrous metal substrates subject to mildly corrosive environments.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Epoxy, Anticorrosive Primer: Solvent-based, two-component, epoxy, anti-corrosive primer; formulated for use on ferrous and galvanized metal substrates.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. Vinyl Wash Primer: Two-component, vinyl butyral/phosphoric acid-wash primer formulated for use over cleaned ferrous metal substrates and zinc-rich primers as a tie coat for subsequent corrosion-resistant primers or finish coatings.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.6 EPOXY COATINGS

- A. Epoxy: Solvent-based, two-component epoxy coating; formulated for resistance to incidental splash and spillage of dilute (5 percent) sulfuric acid, (15 percent) hydrochloric acid, (20 percent) sodium hydroxide, gasoline, and heavy-duty cleaners and detergents; for use on wall and floor surfaces in moderate-to-heavy-traffic commercial and moderate industrial environments.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Gloss Level: Manufacturer's standard [**semigloss**] [**gloss**].

- B. High-Build Epoxy: Two-component epoxy, high-solids, self-priming coating for use on interior or exterior substrates.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Gloss Level: Manufacturer's standard [**low gloss**] [**gloss**].

- C. Epoxy-Modified Latex: Water-based, two-component, epoxy-modified latex paint for use on interior or exterior substrates.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Gloss Level: Manufacturer's standard [**semigloss**] [**gloss**].

D. Epoxy Deck Coating (Slip Resistant): Solvent-based, two-component epoxy, non-slip coating formulated for resistance to abrasion, solvents, fuel, and oils; for use on interior and exterior decks.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.7 POLYURETHANE COATINGS

A. Pigmented Polyurethane: Solvent-based, two-component coating formulated for resistance to abrasion, weathering, and chemical and solvent exposure; for use on interior or exterior substrates.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Gloss Level: Manufacturer's standard [**semigloss**] [**gloss**].

B. Varnish, Aliphatic Polyurethane: Clear, solvent-based, two-component coating formulated for use on interior or exterior wood substrates; manufacturer's standard gloss and sheen.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.8 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor to remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, both coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Cementitious Composition Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Portland Cement (Plaster Stucco): 12 percent. Verify that plaster is fully cured.
6. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.

- C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of **[1500 to 4000 psi (10 350 to 27 580 kPa)] [4000 to 10,000 psi (27 580 to 68 950 kPa)]** at 6 to 12 inches (150 to 300 mm).
 2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of **[100 to 600 psi (690 to 4140 kPa)] [600 to 1500 psi (4140 to 10 350 kPa)] [1500 to 4000 psi (10 350 to 27 580 kPa)]** at 6 to 12 inches (150 to 300 mm).
- F. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other foreign matter. Clean using methods recommended in writing by coating manufacturer[.][**but not less than the following:**]
1. SSPC-SP 7/NACE No. 4.
 2. SSPC-SP 11.
 3. SSPC-SP 6/NACE No. 3.
 4. SSPC-SP 10/NACE No. 2.
 5. SSPC-SP 5/NACE No. 1.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

- H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer that is recommended in writing by topcoat manufacturer for coating system indicated.
 - 2. Sand surfaces that will be exposed to view and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with filler that is recommended in writing by topcoat manufacturer for coating system indicated. Sand smooth when dried.

3.3 APPLICATION OF HIGH-PERFORMANCE COATINGS

- A. Apply coating system products in accordance with manufacturer's written instructions.
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written instructions, apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written instructions.
 - 3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

- A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, CONCRETE SUBSTRATES

- A. Vertical (Nontraffic) Surfaces:
 - 1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
 - 2. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Epoxy, matching intermediate coat.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
- B. Horizontal (Traffic) Surfaces:
 - 1. Epoxy Non-Slip Deck Coating System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Epoxy deck coating (slip resistant).

3.7 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, CEMENTITIOUS SUBSTRATES

- A. Cementitious Composition Board Substrates: **[Siding] [Trim] [Panels] <Insert requirements>**.
 - 1. Epoxy-Modified Latex System:
 - a. Prime Coat: Epoxy-modified latex, matching topcoat.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, **[semigloss] [gloss]**.
 - 2. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.

3. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Epoxy, gloss.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, [**semigloss**] [**gloss**].

B. Portland Cement Plaster (Stucco) Substrates:

1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].

3.8 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, MASONRY SUBSTRATES

A. Clay Masonry Substrates:

1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
2. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Epoxy, matching intermediate coat.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. Topcoat: Pigmented polyurethane, [**semigloss**] [**gloss**].

B. CMU Substrates:

1. Epoxy System:
 - a. Block Filler: Epoxy block filler.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
2. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Block Filler: Epoxy block filler, epoxy.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Pigmented polyurethane [**semigloss**] [**gloss**].

3.9 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, METAL SUBSTRATES

A. Steel Substrates:

1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].

2. Epoxy over Self-Priming Epoxy System:
 - a. Prime Coat: Epoxy, high build, self-priming.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
3. Epoxy Deck Coating over Epoxy Primer and High-Build Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Epoxy deck coating (slip resistant).
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
4. Epoxy Deck Coating over Self-Priming Epoxy System:
 - a. Prime Coat: Epoxy, high build, self-priming.
 - b. Topcoat: Epoxy deck coating (slip resistant).
 - c. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
5. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
6. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
7. Pigmented Polyurethane over Self-Priming Epoxy System:
 - a. Prime Coat: Epoxy, high build, self-priming.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
8. Pigmented Polyurethane over Epoxy Zinc-Rich Primer System:
 - a. Prime Coat: Primer, zinc rich, epoxy.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
9. Pigmented Polyurethane over Epoxy Zinc-Rich Primer and High-Build Epoxy System:
 - a. Prime Coat: Primer, zinc rich, epoxy.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
10. Pigmented Polyurethane over Inorganic Zinc-Rich Primer and High-Build Epoxy System:
 - a. Prime Coat: Primer, zinc rich, inorganic.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

B. Galvanized Metal Substrates:

1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
2. Pigmented Polyurethane over Epoxy Primer System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
3. Pigmented Polyurethane over Vinyl Wash Primer and Epoxy Primer System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Epoxy System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
2. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

D. Copper Substrates:

1. Epoxy System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
2. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

E. Stainless Steel Substrates:

1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Pigmented Polyurethane System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal.
 - c. First and Second Topcoat: Pigmented polyurethane, **[semigloss]** **[gloss]**.

3.10 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, WOOD SUBSTRATES

A. Glued-Laminated Wood Substrates:

1. Pigmented Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss]** **[gloss]**.
2. Clear (Two-Component) Polyurethane System:
 - a. Stain Coat: Stain, exterior, solvent based, semitransparent.
 - b. Prime Coat: Polyurethane, matching topcoat.
 - c. Intermediate Coat: Polyurethane, matching topcoat.
 - d. Topcoat: Varnish, aliphatic polyurethane.

B. Exposed Wood-Framed Substrates:

1. Pigmented Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss]** **[gloss]**.
2. Clear (Two-Component) Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane.

C. Dressed Wood Substrates: **[Wood trim]** **[Architectural woodwork]** **[Doors]** **[Windows]** **[Wood board siding]** **[Railings]** **[and]** **[Fences]** **<Insert requirements>**.

1. Pigmented Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss]** **[gloss]**.
2. Clear (Two-Component) Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane.

3.11 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, MISCELLANEOUS SUBSTRATES

A. Fiberglass Substrates:

1. Epoxy System:

- a. Prime Coat: Epoxy, matching topcoat.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Epoxy-Modified Latex System:

- a. Prime Coat: Epoxy-modified latex, matching topcoat.
- b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
- c. Topcoat: Epoxy-modified latex, **[semigloss] [gloss]**.

3. Pigmented Polyurethane over Epoxy System:

- a. Prime Coat: Epoxy, matching intermediate coat.
- b. Intermediate Coat: Epoxy, gloss.
- c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

3.12 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, CONCRETE SUBSTRATES

A. Vertical (Nontraffic) Surfaces:

1. Epoxy System:

- a. Prime Coat: Epoxy, matching topcoat.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Epoxy, High-Build System:

- a. Prime Coat: High-build epoxy, matching topcoat (reduced).
- b. Intermediate Coat: High-build epoxy, matching topcoat.
- c. Topcoat: High-build epoxy, low gloss.

3. Epoxy-Modified Latex System:

- a. Prime Coat: Epoxy-modified latex, matching topcoat.
- b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
- c. Topcoat: Epoxy-modified latex, **[semigloss] [gloss]**.

B. Horizontal (Traffic) Surfaces.

1. Epoxy System:

- a. Prime Coat: Epoxy, matching topcoat.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Epoxy, High-Build System:

- a. Prime Coat: High-build epoxy, matching topcoat (reduced).
 - b. Intermediate Coat: High-build epoxy, matching topcoat.
 - c. Topcoat: High-build epoxy, [**low gloss**] [**gloss**].
- 3. Pigmented Polyurethane System:
 - a. Prime Coat: Epoxy, gloss.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, [**semigloss**] [**gloss**].
- 4. Clear (Two-Component) Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane.

3.13 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, CEMENTITIOUS SUBSTRATES**A. Cementitious Composition Board Substrates: [**Siding**] [**Trim**] [**Panels**] <Insert requirements>.**

- 1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
- 2. Epoxy-Modified Latex System:
 - a. Prime Coat: Epoxy-modified latex, matching topcoat.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, [**semigloss**] [**gloss**].

3.14 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, MASONRY SUBSTRATES**A. Clay Masonry Substrates:**

- 1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
- 2. Epoxy-Modified Latex System:
 - a. Prime Coat: Epoxy-modified latex, matching topcoat.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, [**semigloss**] [**gloss**].
- 3. Clear (Two-Component) Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.

- c. Topcoat: Varnish, aliphatic polyurethane.

B. CMU Substrates:

- 1. Epoxy System for Dry Environments:
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
- 2. Epoxy System for Wet Environments:
 - a. Block Filler: Epoxy block filler.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
- 3. Epoxy, High-Build System:
 - a. Prime Coat: Epoxy block filler.
 - b. Intermediate Coat: High-build epoxy, matching topcoat.
 - c. Topcoat: High-build epoxy, **[low gloss] [gloss]**.
- 4. Epoxy-Modified Latex System:
 - a. Block Filler: Latex block filler.
 - b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, **[semigloss] [gloss]**.
- 5. Clear (Two-Component) Polyurethane System:
 - a. Prime Coat: Polyurethane, matching topcoat.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Varnish, aliphatic polyurethane.

3.15 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, METAL SUBSTRATES

A. Steel Substrates:

- 1. Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, **[semigloss] [gloss]**.
- 2. High-Build Epoxy over Epoxy Zinc-Rich Primer System:
 - a. Prime Coat: Primer, zinc-rich, epoxy.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Epoxy, **[low gloss] [gloss]**.
- 3. Epoxy over Self-Priming Epoxy System:
 - a. Prime Coat: Epoxy, high build, self-priming.
 - b. Intermediate Coat: Epoxy, matching topcoat.

- c. Topcoat: Epoxy, **[semigloss] [gloss]**.
- 4. Epoxy, High-Build System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: High-build epoxy, matching topcoat.
 - c. Topcoat: High-build epoxy, **[low gloss] [gloss]**.
- 5. Epoxy Deck Coating System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy.
 - c. Topcoat: Epoxy deck coating (slip resistant).
- 6. Epoxy-Modified Latex System:
 - a. Prime Coat, First Coat: Primer, rust inhibitive, water based.
 - b. Prime Coat, Second Coat: Primer, rust inhibitive, water based.
 - c. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - d. Topcoat: Epoxy-modified latex, **[semigloss] [gloss]**.
- 7. Pigmented Polyurethane over Epoxy Primer System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
- 8. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Epoxy, high build, low gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
- 9. Pigmented Polyurethane over Self-Priming Epoxy System:
 - a. Prime Coat: Epoxy, high build, self-priming.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
- 10. Pigmented Polyurethane over Inorganic Zinc-Rich and Epoxy System:
 - a. Prime Coat: Primer, zinc rich, inorganic.
 - b. Intermediate Coat: Epoxy.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.
- 11. Pigmented Polyurethane over Epoxy Zinc-Rich and Epoxy System:
 - a. Prime Coat: Primer, zinc rich, epoxy.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

B. Galvanized Metal Substrates:

- 1. Epoxy over Epoxy Primer System:

- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Epoxy System:

- a. Prime Coat: Primer, vinyl wash.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Pigmented Polyurethane System:

- a. Prime Coat: Primer, vinyl wash.
- b. Intermediate Coat: Epoxy, gloss.
- c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

D. Copper Substrates:

1. Epoxy System:

- a. Prime Coat: Primer, vinyl wash.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Pigmented Polyurethane System:

- a. Prime Coat: Primer, vinyl wash.
- b. Intermediate Coat: Epoxy, gloss.
- c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

E. Stainless Steel Substrates:

1. Epoxy System:

- a. Prime Coat: Primer, epoxy.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Pigmented Polyurethane System:

- a. Prime Coat: Primer, vinyl wash.
- b. Intermediate Coat: Epoxy, gloss.
- c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

3.16 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, WOOD SUBSTRATES

A. Glued-Laminated Wood Substrates:

1. Epoxy System:

- a. Prime Coat: Epoxy, matching topcoat.
- b. Intermediate Coat: Epoxy, matching topcoat.

c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Pigmented Polyurethane System:

- a. Prime Coat: Polyurethane, matching topcoat.
- b. Intermediate Coat: Polyurethane, matching topcoat.
- c. Topcoat: Pigmented polyurethane, **[semigloss] [gloss]**.

3. Clear (Two-Component) Polyurethane System:

- a. Prime Coat: Polyurethane, matching topcoat.
- b. Intermediate Coat: Polyurethane, matching topcoat.
- c. Topcoat: Varnish, aliphatic polyurethane, .

B. Exposed Wood-Framed Substrates:

1. Clear (Two-Component) Polyurethane System:

- a. Prime Coat: Polyurethane, matching topcoat.
- b. Intermediate Coat: Polyurethane, matching topcoat.
- c. Topcoat: Varnish, aliphatic polyurethane.

C. Dressed Wood Substrates: **[Wood trim] [Architectural woodwork] [Doors] [Windows] [and] [Wood board paneling]**.

1. Epoxy System:

- a. Prime Coat: Epoxy, matching topcoat.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, **[semigloss] [gloss]**.

2. Clear (Two-Component) Polyurethane System:

- a. Prime Coat: Polyurethane, matching topcoat.
- b. Intermediate Coat: Polyurethane, matching topcoat.
- c. Topcoat: Varnish, aliphatic polyurethane.

D. Wood-Traffic Substrates: **[Floors] [and] [stairs]**.

1. Clear (Two-Component) Polyurethane System:

- a. Prime Coat: Polyurethane, matching topcoat.
- b. Intermediate Coat: Polyurethane, matching topcoat.
- c. Topcoat: Varnish, aliphatic polyurethane, .
- d. Additive: Manufacturer's standard additive to increase skid resistance of coated surface.

3.17 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, GYPSUM-BASED SUBSTRATES

A. Gypsum Board and Plaster Substrates:

1. Epoxy System:

- a. Prime Coat: Primer sealer, latex, interior.

- b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
- 2. Epoxy, High-Build System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Intermediate Coat: High-build epoxy, matching topcoat.
 - c. Topcoat: High-build epoxy, [**low gloss**] [**gloss**].
- 3. Epoxy-Modified Latex System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, [**semigloss**] [**gloss**].

3.18 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE, MISCELLANEOUS SUBSTRATES

A. Fiberglass Substrates:

- 1. Epoxy System:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, [**semigloss**] [**gloss**].
- 2. Pigmented Polyurethane System:
 - a. Prime Coat: Epoxy, gloss.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Pigmented polyurethane, [**semigloss**] [**gloss**].
- 3. Epoxy-Modified Latex System:
 - a. Epoxy-modified latex, matching topcoat.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, [**semigloss**] [**gloss**].

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Task	Specification	Specification Description
09 96 00 00	09 91 13 00a	High-Temperature-Resistant Coatings
09 96 23 00	09 91 13 00a	High-Temperature-Resistant Coatings



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SECTION 09 96 53 00 - ELASTOMERIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Elastomeric coating systems.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting."
 - 2. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include preparation requirements and application instructions.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of elastomeric topcoat product.
- C. Samples for Verification: For each type of elastomeric topcoat product indicated and in each color and gloss. Submit **[actual coating system drawdowns as specified below][coating manufacturer's standard printed cards]** for verification Samples.
 - 1. Submit Samples on same type of substrate as that to receive application, **8 inches (200 mm)** square.
 - 2. Apply coats on Samples in steps to show each separate coat, including primers and block fillers as applicable.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in the Elastomeric Coating Schedule to cross-reference coating systems specified in this Section. Include color designations.
- E. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Environmental Product Declaration (EPD): For each product.
 - 3. Health Product Declaration (HPD): For each product.
 - 4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
 - 5. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same production run,**] that match products installed and that are

packaged with protective covering for storage and identified with labels describing contents.

1. Elastomeric Coating System Products: Furnish an additional [5]<Insert number> percent but not less than [1 gal. (3.8 L)]<Insert quantity> of each material, color, and texture applied.

1.4 MOCKUPS

- A. Apply mockups of each coating system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Vertical Surfaces: Provide samples of at least **100 sq. ft (9 sq. m)**.
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between **50 and 90 deg F (10 and 32 deg C)** unless otherwise permitted by manufacturer's written instructions.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
- C. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before starting or continuing coating operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace

elastomeric coatings that fail within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Water penetration through the coating.
 - b. Deterioration of coating beyond normal weathering.
 - c. **<Insert failure modes>**.
2. Warranty Period: **[Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each coating system product from single source from single manufacturer.

2.2 ELASTOMERIC COATINGS, GENERAL

- A. Elastomeric Coating Systems: Subject to compliance with requirements, **[provide product][provide one of the products][available products that may be incorporated into the Work include but are not limited to products]** listed in the Elastomeric Coating Schedule Article for the substrate category indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Insl-X Products; Benjamin Moore & Co.]**
 - e. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - f. **[Rodda Paint Co.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **[Sto Corp.]**
 - i. **[Textured Coatings of America, Inc]**
 - j. **[The Pittsburgh Paints Company]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Behr Paint Company (Behr Process LLC)]**
 - b. **[Benjamin Moore & Co.]**
 - c. **[Coronado Paint; Benjamin Moore & Co.]**
 - d. **[Insl-X Products; Benjamin Moore & Co.]**
 - e. **[Pratt & Lambert; a subsidiary of The Sherwin-Williams Company]**
 - f. **[Rodda Paint Co.]**
 - g. **[Sherwin-Williams Company (The)]**
 - h. **[Sto Corp.]**
 - i. **[Textured Coatings of America, Inc]**

- j. **[The Pittsburgh Paints Company]**
 k. **<Insert manufacturer's name>**

- B. Moisture-Vapor Transmission: Minimum **<Insert perms (metric perms)>**, based on testing in accordance with ASTM D1653.
- C. Material Compatibility:
1. Materials for use within each coating system are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a coating system, products are recommended in writing by manufacturers of topcoat for use in elastomeric coating system and on substrate indicated.
- D. VOC Content: For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- E. Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule]<Insert requirements>**.
1. **[10][20][30]<Insert number>** percent of surface area will be coated with deep tones.
- F. Crack Fillers: Elastomeric coating manufacturer's recommended, factory-formulated crack fillers or sealants, including crack filler primers, compatible with substrate and other materials indicated.
- G. Primer: Elastomeric coating manufacturer's recommended, factory-formulated, alkali-resistant primer compatible with substrate and other materials indicated.
- H. Concrete Masonry Unit Block Filler: Elastomeric coating manufacturer's recommended, factory-formulated, high-performance latex block filler compatible with substrate and other materials indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with manufacturer's requirements for maximum moisture content, alkalinity, and other conditions affecting performance of the Work.
- B. Begin coating only when moisture content of substrate is 12 percent or less when measured with an electronic moisture meter.

- C. Begin coating no sooner than [28]<Insert number> days after substrate is constructed and is visually dry on both sides.
- D. Verify that substrate is within the range of alkalinity recommended by manufacturer.
- E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- F. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Application of coating system indicates acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- B. Remove hardware and hardware accessories, plates, machined surfaces, light fixtures, and similar items already installed that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
 - 2. Perform cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- D. Crack Repair: Fill cracks in accordance with manufacturer's written instructions before coating surfaces.

3.3 APPLICATION OF ELASTOMERIC COATING SYSTEMS

- A. Apply elastomeric coatings in accordance with manufacturer's written instructions.
 - 1. Use equipment and techniques best suited for substrate and type of material being applied.
 - 2. Coat surfaces behind movable items the same as similar exposed surfaces.
 - 3. Apply each coat separately in accordance with manufacturer's written instructions.
- B. Primers: Apply at a rate to ensure complete coverage.
- C. Block Fillers: Apply at a rate to ensure complete coverage with pores filled.
- D. Elastomeric Finish Coat(s): **[Minimum two coats with a total dry film thickness of 16 to 18 mils (0.41 to 0.45 mm)][Minimum one coat with a total dry film thickness of 7 to 10 mils (0.18 to 0.25 mm)][Manufacturer's recommended number of coats and total dry film thickness for condition of substrate]<Insert requirement>.**
- E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats similar to color of topcoat, but provide sufficient difference in

shade of undercoats to distinguish each separate coat.

- F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform finish, color, and appearance.
- G. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- H. Apply coatings to prepared surfaces as soon as practicable after preparation and before subsequent surface soiling or deterioration.
- I. Spray Application: Use spray equipment for application only when permitted by authorities having jurisdiction. Wherever spray application is used, do not double back with spray equipment to build up film thickness of two coats in one pass.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following testing procedures:
 - 1. Owner will engage the services of a qualified testing agency to sample materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance of materials with product requirements.
 - 3. Owner may direct Contractor to stop coating application if test results show materials being used do not comply with requirements. Remove noncomplying materials from Project site, pay for testing, and recoat surfaces that were coated with rejected materials. Remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.
- B. Field Testing and Inspection: Owner reserves the right to engage the services of a qualified testing agency to verify installed thickness of elastomeric coatings.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities, touch up and restore damaged or defaced coated surfaces.

3.6 ELASTOMERIC COATING SCHEDULE

- A. Concrete Substrates:
 - 1. Elastomeric Coating System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Elastomeric, pigmented, exterior, water-based, [flat][nonflat] coating.

1) <Insert manufacturer's name; product name or designation>.

B. Concrete Masonry Unit Substrates:

1. Elastomeric Coating System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Block Filler: As recommended in writing by topcoat manufacturer.
- c. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- d. Topcoat: Elastomeric, pigmented, exterior, water-based, [flat][nonflat] coating.

1) <Insert manufacturer's name; product name or designation>.

C. Stucco Substrates:

1. Elastomeric Coating System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Elastomeric, pigmented, exterior, water-based, [flat][nonflat] coating.

1) <Insert manufacturer's name; product name or designation>.

END OF SECTION 09 96 53 00



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Task	Specification	Specification Description
09 96 53 00	09 91 13 00	Exterior Painting
09 96 53 00	09 91 13 00a	High-Temperature-Resistant Coatings
09 96 56 00	09 96 00 00	High-Performance Coatings
09 96 56 00	09 91 13 00a	High-Temperature-Resistant Coatings
09 96 66 00	09 91 13 00a	High-Temperature-Resistant Coatings
09 96 66 00	09 97 26 00	Cementitious Coatings
09 97 13 23	09 96 00 00	High-Performance Coatings
09 97 13 24	09 96 00 00	High-Performance Coatings



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SECTION 09 97 26 00 - CEMENTITIOUS COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and application of cementitious coating systems on the following substrates:
 - 1. [Exterior][Interior] concrete.
 - 2. [Exterior][Interior] concrete masonry units.
 - 3. [Exterior][Interior] brick.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: In each color and gloss of topcoat.
 - 1. Submit Samples on [rigid backing][actual substrate], not less than **8 inches (200 mm)** square[, **with mortar joint in center**].
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each cementitious coating, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency, for each product formulation.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are from same production run (batch mix) as materials applied and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional [5]<Insert number> percent of each color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of coating system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one **[actual substrate of each type]<Insert requirements>** to represent surfaces and conditions for application of coating.
 - a. Wall Surfaces: Prepare Samples of at least **[100 sq. ft. (9.3 sq. m)]<Insert dimension>**.
 - 2. Apply mockups after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of colors selected by Architect at no added cost to Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Contents by volume, for pigment and vehicle constituents.
 - 4. Application instructions.
 - 5. Color name and number.
 - 6. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F (7 deg C)**. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
 - 1. Protect cementitious coating materials from freezing. Keep materials dry and storage area neat and orderly. Remove waste daily. Take necessary measures to ensure that workers and work areas are protected from health hazards resulting from handling, mixing, and applying the coating.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 CEMENTITIOUS COATINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 2. **[Fox Industries, Inc.]**
 3. **[Gemite Products Inc., a W.R. Meadows company]**
 4. **[MAPEI Corporation]**
 5. **[Master Builders Solutions]**
 6. **[Sakrete; CRH Americas, Oldcastle APG]**
 7. **[Silpro Corporation]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 2. **[Fox Industries, Inc.]**
 3. **[Gemite Products Inc., a W.R. Meadows company]**
 4. **[MAPEI Corporation]**
 5. **[Master Builders Solutions]**
 6. **[Sakrete; CRH Americas, Oldcastle APG]**
 7. **[Silpro Corporation]**
 8. **<Insert manufacturer's name>**
- C. Products: Subject to compliance with requirements, **[provide product][provide one of the products][available products that may be incorporated into the Work include, but are not limited to products]** listed in the Cementitious Coating Schedule for the paint category indicated.
- D. Source Limitations: Obtain cementitious coating materials from single source and from single manufacturer.
- E. Polymer-Modified Cementitious Coating: Containing portland cement, polymer, and hydrated lime or aggregates.
1. Compressive Strength: Not less than **[3500 psi (24.1 MPa)]<Insert value>** at 28 days according to ASTM C109/C109M.
 2. Tensile Strength: Not less than **[350 psi (2.41 MPa)]<Insert value>** at 28 days according to ASTM C109/C109M.
 3. Flexural Strength: **<Insert value and test method>**.
 4. Adhesion: **<Insert value and test method>**.
 5. Permeance: **<Insert value and test method>**.
 6. Accelerated Weathering: **<Insert value and test method>**.
 7. UV Resistance: **<Insert value and test method>**.
 8. Salt-Spray Resistance: **<Insert value and test method>**.
 9. **<Insert performance requirements>**.
- F. VOC Content, LEED 2009: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
- G. Low-Emitting Materials, LEED 2009: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. VOC Content, LEED v4: For field applications[**that are inside the weatherproofing system**], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Primers, Sealers, and Undercoaters: 100 g/L.
- I. Low-Emitting Materials, LEED v4: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Material Emissions and Pollutant Control: Not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoaters: 100 g/L.
- K. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoats: 100 g/L.
- L. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- M. Colors: **[As selected by Architect from manufacturer's full range][Match Architect's samples][As**

indicated in a color schedule]<Insert requirements>.

- N. Other Materials: Provide crack fillers, block fillers, and related materials that are compatible with cementitious finish-coat materials and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for mixing and preparing materials and as applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, incompatible coatings, and loose substrate materials.
- D. Cementitious and Masonry Surfaces: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Crack Repair: Fill cracks according to manufacturer's written instructions before coating surfaces.
 - 1. Cracks Larger Than **1/32 Inch (0.8 mm)**: Cut out static cracks, voids, or honeycombing larger than **1/32 inch (0.8 mm)** and patch with materials recommended in writing by coating manufacturer. Identify dynamic cracks and treat according to manufacturer's written instructions before beginning application.

3.3 APPLICATION

- A. Apply coatings according to manufacturer's written instructions. Use applicators and techniques suited for coating and substrate indicated.
 - 1. Dampen substrate of surfaces to receive cementitious coatings one hour before beginning

application to prevent surface drag. Immediately before applying coatings, redampen substrate. Substrates shall be saturated and surface dry at time of application.

2. Brushes: Use Tampico or masonry brushes best suited for material being applied.
3. Spray Equipment: Use spray equipment recommended in writing by manufacturer for material and texture required.

B. Apply coating to achieve material thickness as recommended in writing by manufacturer, but not less than the following:

1. First Coat: Apply polymer-modified cementitious coating material at the rate of **2 lb/sq. yd. (1 kg/sq. m)** to achieve a total cured thickness of **25 mils (0.6 mm)**.
2. Second Coat: Apply polymer-modified cementitious coating material at the rate of **1 lb/sq. yd. (0.5 kg/sq. m)** to achieve a total cured thickness of **15 mils (0.4 mm)**.
3. Apply additional coats when undercoats or other conditions show through final coat until cured film is of uniform coating finish, color, and appearance.

C. On previously coated surfaces, apply coating to achieve material thickness as recommended in writing by manufacturer, but not less than the following:

1. Apply polymer-modified cementitious coating material at the rate of **1 lb/sq. yd. (0.5 kg/sq. m)** to achieve a total cured thickness of **15 mils (0.4 mm)**.
2. Apply additional coats when undercoats or other conditions show through final coat until cured film is of uniform coating finish, color, and appearance.

D. Brush Application: Brush out and work brush coats into surfaces in an even film, filling all pores and voids at rate recommended in writing by manufacturer to achieve cured material thickness indicated. Finish coat with smooth, horizontal strokes.

E. Spray Application: Apply each coat according to manufacturer's written instructions to provide the equivalent hiding of brush-applied coats. Follow spray application with a general light brooming of coated surface to impart a slight texture.

3.4 FIELD QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coating operations are being conducted:

1. Owner will engage the services of a qualified testing agency to sample coating materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements specified.
3. Owner may direct Contractor to stop coating application if test results show materials being used do not comply with requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing,

scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 CEMENTITIOUS COATING SCHEDULE

A. Above-Grade Concrete and Masonry:

1. Polymer-Modified Cementitious Coating:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Polymer-modified cementitious coating.

1) <Insert manufacturer's name; product name or designation>.

END OF SECTION 09 97 26 00



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Task	Specification	Specification Description
09 97 26 13	09 96 00 00	High-Performance Coatings
09 97 26 13	09 97 26 00	Cementitious Coatings
09 97 35 00	09 91 23 00	Interior Painting
09 97 63 00	01 11 19 00	No Specification Required
09 97 63 00	09 96 00 00	High-Performance Coatings
09 97 63 00	23 05 00 00a	Coatings for HVAC



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Task	Specification	Specification Description
10 01 50 11	10 51 13 00	Metal Lockers



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SECTION 10 11 00 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Visual display board assemblies.
2. Floor-to-ceiling visual display assemblies.
3. Rail support system for visual display board assemblies.
4. Modular support system for visual display board assemblies.
5. Sliding visual display units.
6. Visual display conference units.
7. Glass markerboards.
8. Display rails.
9. Natural-slate chalkboards.

B. Related Requirements:

1. Section 097723 "Fabric-Wrapped Panels" for tackable, fabric-covered panels mounted on walls.
2. Section 101146 "Visual Display Fabrics" for visual display wall coverings intended for use with dry-erase markers.
3. Section 101200 "Display Cases" for **[individually framed and enclosed, wall-mounted bulletin boards][and for][tackboards within display cases]**.

1.2 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Visual display board assemblies.
2. Floor-to-ceiling visual display assemblies.
3. Rail support system for visual display board assemblies.
4. Modular support system for visual display board assemblies.
5. Sliding visual display units.
6. Visual display conference units.
7. Glass markerboards.
8. Display rails.
9. Natural-slate chalkboards.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Include electrical characteristics for motorized units.

C. Sustainable Design Submittals:

1. Product Data: For installation adhesives, indicating VOC content.
2. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
6. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

D. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints. [**Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.**]
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.
5. Include wiring diagrams for power and control wiring.

E. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Samples of facings for each visual display panel type, indicating color and texture.
2. Fabric swatches of fabric facings for tackboards.
3. Actual factory-finish color samples, applied to [aluminum][wood] substrate.
4. Include accessory Samples to verify color selected.

F. Samples for Verification: For each type of visual display unit indicated.

1. Visual Display Panel: Not less than **8-1/2 by 11 inches (215 by 280 mm)**, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: **6-inch- (150-mm-)** long sections of each trim profile.
3. Display Rail: **6-inch- (150-mm-)** long section of each type.
4. [Rail][Modular] Support System: **6-inch- (150-mm-)** long sections.
5. Accessories: Full-size Sample of each type of accessory.

G. Product Schedule: For visual display units. [**Use same designations indicated on Drawings.**]

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each visual display unit, for tests performed by [manufacturer and witnessed by a qualified testing agency][a qualified testing agency].

C. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For visual display units[**and motorized units**] to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical [**wall area**][**visual display unit**][**floor-to-ceiling visual display assembly**]**<Insert description>** as shown on Drawings. Include accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period:
 - a. **[50]<Insert number>** years from date of Substantial Completion.
 - b. Life of the building.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25]<Insert value>** or less.
 - 2. Smoke-Developed Index: **[50][450]<Insert value>** or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 VISUAL DISPLAY BOARD ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[A-1 Visual Systems]**
 - 2. **[Aarco Products, Inc.]**
 - 3. **[ADP Lemco]**
 - 4. **[ASI Visual Display Products]**
 - 5. **[Aywon]**
 - 6. **[Bangor Cork]**
 - 7. **[CIG JAN Products, Ltd.]**
 - 8. **[Claridge Products and Equipment, LLC.]**
 - 9. **[Delta Products Ltd]**
 - 10. **[Egan Visual]**
 - 11. **[Erase, Inc.]**
 - 12. **[EVERWhite Whiteboards]**
 - 13. **[ghent; a GMi Company]**
 - 14. **[K-Pro Specialty Products]**
 - 15. **[Magna Visual Corp.]**
 - 16. **[Marsh Industries, Inc.]**
 - 17. **[MooreCo Inc]**
 - 18. **[Nudo]**
 - 19. **[Panel Processing, Inc.]**
 - 20. **[Peter Pepper Products, Inc]**
 - 21. **[Platinum Visual Solutions]**
 - 22. **[PolyVision Corporation]**
 - 23. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[A-1 Visual Systems]**
 - 2. **[Aarco Products, Inc.]**
 - 3. **[ADP Lemco]**
 - 4. **[ASI Visual Display Products]**
 - 5. **[Aywon]**
 - 6. **[Bangor Cork]**
 - 7. **[CIG JAN Products, Ltd.]**

8. [Claridge Products and Equipment, LLC.]
 9. [Delta Products Ltd]
 10. [Egan Visual]
 11. [Everase, Inc.]
 12. [EVERWhite Whiteboards]
 13. [ghent; a GMi Company]
 14. [K-Pro Specialty Products]
 15. [Magna Visual Corp.]
 16. [Marsh Industries, Inc.]
 17. [MooreCo Inc]
 18. [Nudo]
 19. [Panel Processing, Inc.]
 20. [Peter Pepper Products, Inc]
 21. [Platinum Visual Solutions]
 22. [PolyVision Corporation]
 23. <Insert manufacturer's name>
- C. Visual Display Board Assembly: [Field][or][factory] fabricated.
1. Assembly: [Chalkboard][markerboard][and][tackboard].
 2. Corners: [Square][Rounded].
 3. Width: [As indicated on Drawings]<Insert dimension>.
 4. Height: [As indicated on Drawings]<Insert dimension>.
 5. Mounting Method: [Direct to wall][Rail support system][Modular support system].
- D. Chalkboard Panel: [Porcelain-enamel][High-pressure chalkboard laminate][Melamine][Painted-finish]-faced chalkboard panel on core indicated.
1. Color: [Green][Blue][Brown][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- E. Markerboard Panel: [Porcelain-enamel-faced][High-pressure markerboard laminate-faced][Melamine-faced]<Insert facing> markerboard panel on core indicated.
1. Color: [White][Beige][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- F. Tackboard Panel: [Natural-cork][Plastic-impregnated-cork][Vinyl-fabric-faced][Polyester-fabric-faced] tackboard panel on core indicated.
1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
 2. Color and Pattern: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
- G. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; [standard size and shape][slim size and standard shape][of size and shape indicated on Drawings]<Insert size and shape>.
1. Field-Applied Trim: Manufacturer's standard, [snap-on trim with no visible screws or exposed joints][slip-on trim][screw-on trim with Phillips flat-head screws].
 2. Aluminum Finish: [Clear anodic][Color anodic][Manufacturer's standard baked-enamel or powder-coat] finish.
 - a. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect

from full range of industry colors and color densities]<Insert color>.

- H. Factory-Applied Wood Trim: **[Red oak][Walnut][Manufacturer's standard species]<Insert species>**, not less than **1/2 inch (13 mm)** thick; **[standard size and shape][of size and shape indicated on Drawings]<Insert size and shape>** with **[opaque][transparent]** finish.
- I. Field-Applied Wood Trim: Comply with requirements specified in **[Section 062023 "Interior Finish Carpentry."][Section 064023 "Interior Architectural Woodwork."]**
- J. Vinyl Trim: **[Dark brown][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]**.
- K. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, **[balanced around center of board, as acceptable to Architect][as indicated on approved Shop Drawings]**.
- L. Combination Assemblies: Provide **[manufacturer's standard exposed trim][H-trim][hidden spline]** between abutting sections of visual display panels.
- M. Chalktray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - 2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
- N. Display Rail: Manufacturer's standard, extruded-aluminum display rail with **[plastic-impregnated-cork]<Insert material>** insert, end stops, **[and continuous paper holder,]** designed to hold accessories.
 - 1. Size: **[1 inch (25 mm)][2 inches (50 mm)][3 inches (75 mm)]** high by **[full length of visual display unit][length indicated on Drawings]**.
 - 2. Map Hooks: **[Two]<Insert number>** map hooks for every **[48 inches (1200 mm)]<Insert dimension>** of display rail or fraction thereof.
 - 3. Map Hooks and Clips: **[Two]<Insert number>** map hooks with flexible metal clips for every **[48 inches (1200 mm)]<Insert dimension>** of display rail or fraction thereof.
 - 4. Flag Holder: **[One]<Insert number>** for each room.
 - 5. Tackboard Insert Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
 - 6. Aluminum Color: Match finish of visual display assembly trim.
- O. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.
- P. Special-Purpose Graphics: Fuse or paint **[semivisible writing guidelines][penmanship lines][music staff lines][grid, 1 inch (25 mm) square][rectangular graph coordinates][polar graph coordinates][horizontal lines, 2 inches (50 mm) o.c.][USA map][world map][soccer field][football field][basketball court]<Insert description of special-purpose graphics>** graphic onto surface of visual display unit[, **in locations indicated]**.

2.3 FLOOR-TO-CEILING VISUAL DISPLAY ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Claridge Products and Equipment, LLC.]**

2. **[Egan Visual]**
 3. **[EVERWhite Whiteboards]**
 4. **[K-Pro Specialty Products]**
 5. **[Platinum Visual Solutions]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Claridge Products and Equipment, LLC.]**
 2. **[Egan Visual]**
 3. **[EVERWhite Whiteboards]**
 4. **[K-Pro Specialty Products]**
 5. **[Platinum Visual Solutions]**
 6. **<Insert manufacturer's name>**
- C. Floor-to-Ceiling Markerboard Panel Assemblies: Consisting of markerboard panels with **[porcelain-enamel][high-pressure markerboard laminate]** facing on core indicated; fabricated for floor-to-ceiling assemblies.
1. Color: **[White][Beige][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
- D. Floor-to-Ceiling Tackboard Panel Assemblies: Consisting of tackboard panels with **[natural-cork][plastic-impregnated-cork][vinyl-fabric][polyester-fabric]** facing on core indicated; fabricated for floor-to-ceiling assemblies.
1. Edge Treatments:
 - a. Panel-Joint Edges: **[Wrapped with fabric][Concealed by fabric-covered trim]**.
 - b. Top-of-Wall Edges: **[Wrapped with fabric][Concealed by fabric-covered trim]**.
 - c. Bottom-of-Wall Edges: **[Wrapped with fabric][Concealed by fabric-covered trim]**.
 - d. Corners: **[Wrapped with fabric][Concealed by fabric-covered trim]**.
 2. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
- E. Width: **[Full width of wall][As indicated on Drawings]<Insert dimension>**.
- F. Height: **[Full height of wall][Full height of wall above base][As indicated on Drawings]<Insert dimension>**.
- G. Joint Accessories: Manufacturer's standard, **[exposed color-matched trim][fabric-covered trim][concealed aluminum or steel spline]** at butt joints.
- 2.4 RAIL SUPPORT SYSTEM FOR VISUAL DISPLAY BOARD ASSEMBLIES
- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Egan Visual]**
 2. **[Peter Pepper Products, Inc]**
 3. **<Insert manufacturer's name>**



- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Egan Visual]**
 - 2. **[Peter Pepper Products, Inc]**
 - 3. **<Insert manufacturer's name>**
- C. Support Rails: Horizontal, wall-mounted, extruded-aluminum rails designed to receive hanger clip and to support visual display boards[; **and capable of gripping and suspending paper directly from rail**].
 - 1. Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - 2. Color and Gloss: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- D. Hanger Clips: Extruded aluminum with finish to match rails; designed to support independent visual display board assemblies by engaging support rail and top trim of board.
- E. Visual Display Board Assemblies: Fabricated from not less than **3/8-inch- (9.5-mm-)** thick, kraft-paper honeycomb core; designed to be rigid and to resist warpage, and with aluminum trim designed to engage hanger clips.

2.5 MODULAR SUPPORT SYSTEM FOR VISUAL DISPLAY BOARD ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[ADP Lemco]**
 - 2. **[Claridge Products and Equipment, LLC.]**
 - 3. **[MooreCo Inc]**
 - 4. **[Platinum Visual Solutions]**
 - 5. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[ADP Lemco]**
 - 2. **[Claridge Products and Equipment, LLC.]**
 - 3. **[MooreCo Inc]**
 - 4. **[Platinum Visual Solutions]**
 - 5. **<Insert manufacturer's name>**
- C. Standards: **72-inch- (1830-mm-)** long, extruded-aluminum slotted standards designed for supporting visual display boards on panel clips. Space slots at not less than **[4 inches (100 mm)]<Insert dimension>** o.c.
 - 1. Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - 2. Color and Gloss: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

- D. Panel Clips: Extruded aluminum or steel with finish to match standards.

2.6 SLIDING VISUAL DISPLAY UNITS

- A. Horizontal-Sliding Visual Display Units: Factory-fabricated units consisting of extruded-aluminum tubular frame, fixed rear visual display panel, aluminum-framed horizontal-sliding visual display panels, and extruded-aluminum fascia that conceals overhead sliding track; designed for recessed mounting. Provide panels that operate smoothly without vibration or chatter.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Aarco Products, Inc.]**
 - b. **[ADP Lemco]**
 - c. **[ASI Visual Display Products]**
 - d. **[Aywon]**
 - e. **[Claridge Products and Equipment, LLC.]**
 - f. **[ghent; a GMi Company]**
 - g. **[K-Pro Specialty Products]**
 - h. **[MooreCo Inc]**
 - i. **[Platinum Visual Solutions]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aarco Products, Inc.]**
 - b. **[ADP Lemco]**
 - c. **[ASI Visual Display Products]**
 - d. **[Aywon]**
 - e. **[Claridge Products and Equipment, LLC.]**
 - f. **[ghent; a GMi Company]**
 - g. **[K-Pro Specialty Products]**
 - h. **[MooreCo Inc]**
 - i. **[Platinum Visual Solutions]**
 - j. **<Insert manufacturer's name>**
3. Two-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide two sliding panels, each equal to not less than one-half of overall length of unit.
4. Three-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide three sliding panels, each equal to not less than **[one-third][one-half]** of overall length of unit.
5. Four-Track Units: Fabricate unit with fixed rear panel centered in and covering not less than one-half of rear surface, and fixed front panel on each side of unit equal to not less than one-quarter of overall length of unit. Provide four sliding panels, each equal to not less than one-quarter of overall length of unit.
 - a. Swinging Doors: Fabricated from same construction as sliding panels and supported on full-height continuous hinges. Provide visual display panel on both faces of each door.
6. Hardware: Manufacturer's standard, extruded-aluminum overhead track and channel-shaped bottom guides; with two nylon ball-bearing carriers and two nylon rollers for each sliding panel.
7. Overall Width: **[As indicated on Drawings]<Insert dimension>**.

8. Overall Height: **[As indicated on Drawings]<Insert dimension>**.

B. Vertical-Sliding Visual Display Units: Factory-fabricated units consisting of extruded-aluminum tubular frame, fixed rear visual display panel, and aluminum-framed vertical-sliding panels; **[motor operated];** designed for recessed mounting. Provide panels that operate smoothly without vibration or chatter.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Aarco Products, Inc.]**
- b. **[ADP Lemco]**
- c. **[ASI Visual Display Products]**
- d. **[Aywon]**
- e. **[Claridge Products and Equipment, LLC.]**
- f. **[K-Pro Specialty Products]**
- g. **[MooreCo Inc]**
- h. **[Platinum Visual Solutions]**
- i. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Aarco Products, Inc.]**
- b. **[ADP Lemco]**
- c. **[ASI Visual Display Products]**
- d. **[Aywon]**
- e. **[Claridge Products and Equipment, LLC.]**
- f. **[K-Pro Specialty Products]**
- g. **[MooreCo Inc]**
- h. **[Platinum Visual Solutions]**
- i. **<Insert manufacturer's name>**

3. Type: Tubular frame on **[four sides][top and two sides, with sides extending to floor; with kick panel to conceal sliding panels]**. Design unit to support panels independently of wall.

4. Two-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide two sliding panels, each equal to not less than one-half of overall height of unit.

5. Three-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide three sliding panels, each equal to not less than one-half of overall height of unit.

6. Four-Track Units: Fabricate unit with fixed rear panel centered in and covering not less than one-half of rear surface. Provide four sliding panels, each equal to not less than one-half of overall height of unit.

7. Hardware: Manufacturer's standard, neoprene ball-bearing end rollers, four on each side of each sliding panel. Counterbalance each sliding panel with counterweights supported by steel aircraft cable over ball-bearing sheaves; with removable cover plate for access to counterweights. Provide rubber bumpers at top and bottom for each sliding panel.

8. Motorized Operation: Provide not less than one motor with gearhead reducers for each sliding panel, mounted above visual display unit and connected to sliding panels with steel aircraft cable. Provide removable cover plate for access to motor. Equip motors with limit switches to automatically stop motor at each end of travel.

a. Electric Motors: UL approved or recognized, totally enclosed, complying with NEMA MG 1,

- with thermal-overload protection; 1/15 hp, single phase, [110][220] V, 60 Hz.
 - b. Control Station: Three-position, [maintained][momentary] contact, switch-operated control station with open, close, and off functions; with NEMA ICS 6, Type 1 enclosure. Provide [one]<Insert number> control station(s) for each sliding panel unit.
 - c. Key Switch: Provide supplementary key switch for each control station. Furnish two keys for each control station, keyed alike.
- 9. Overall Width: [As indicated on Drawings]<Insert dimension>.
 - 10. Overall Height: [As indicated on Drawings]<Insert dimension>.

C. Panels and Accessories:

- 1. Sliding Chalkboard Panel: [Porcelain-enamel][High-pressure chalkboard laminate]-faced chalkboard panel on kraft-paper honeycomb core designed to be rigid and to resist warpage, not less than [3/8 inch (9.5 mm)]<Insert dimension> thick.
 - a. Color: [Green][Blue][Brown][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- 2. Sliding Markerboard Panel: [Porcelain-enamel][High-pressure markerboard laminate]-faced markerboard panel on kraft-paper honeycomb core designed to be rigid and to resist warpage, not less than [3/8 inch (9.5 mm)]<Insert dimension> thick.
 - a. Color: [White][Beige][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- 3. Sliding Tackboard Panel: [Natural-cork][Plastic-impregnated-cork][Vinyl-fabric-faced][Polyester-fabric-faced] tackboard panel on kraft-paper honeycomb core designed to be rigid and to resist warpage, not less than [3/8 inch (9.5 mm)]<Insert dimension> thick.
 - a. Color and Pattern: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
- 4. Fixed Rear Chalkboard Panel: [Porcelain-enamel][High-pressure chalkboard laminate]-faced chalkboard panel on core indicated.
 - a. Color: [Green][Blue][Brown][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- 5. Fixed Rear Markerboard Panel: [Porcelain-enamel][High-pressure markerboard laminate]-faced markerboard panel on core indicated.
 - a. Color: [White][Beige][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
- 6. Fixed Rear Tackboard Panel: [Natural-cork][Plastic-impregnated-cork][Vinyl-fabric-faced][Polyester-fabric-faced] tackboard panel on core indicated.
 - a. Color and Pattern: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
- 7. Kick Panel: Manufacturer's standard [fabric-covered cork][low-pressure laminate].

- a. Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]**.
8. Accessories: **[Chalktray][locks][and][easel pad clamps]**.
9. Display Rail: Manufacturer's standard, extruded-aluminum display rail with **[plastic-impregnated-cork]<Insert material>** insert, end stops, **[and continuous paper holder,]** designed to hold accessories.
 - a. Size: **[1 inch (25 mm)][2 inches (50 mm)][3 inches (75 mm)]** high by full length of visual display unit.
 - b. Map Hooks: **[Two]<Insert number>** map hooks for every **[48 inches (1200 mm)]<Insert dimension>** of display rail or fraction thereof.
 - c. Flag Holder: **[One]<Insert number>** for each sliding visual display unit.
 - d. Tackboard Insert Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
10. Aluminum Trim: **[Factory applied][Field applied]**; in **[manufacturer's standard]<Insert description>** size and profile; with **[clear anodic]<Insert description>** finish.

2.7 VISUAL DISPLAY CONFERENCE UNITS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[A-1 Visual Systems]**
 2. **[Aarco Products, Inc.]**
 3. **[ASI Visual Display Products]**
 4. **[CIG JAN Products, Ltd.]**
 5. **[Claridge Products and Equipment, LLC.]**
 6. **[Egan Visual]**
 7. **[ghent; a GMi Company]**
 8. **[K-Pro Specialty Products]**
 9. **[MooreCo Inc]**
 10. **[Peter Pepper Products, Inc]**
 11. **[Platinum Visual Solutions]**
 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[A-1 Visual Systems]**
 2. **[Aarco Products, Inc.]**
 3. **[ASI Visual Display Products]**
 4. **[CIG JAN Products, Ltd.]**
 5. **[Claridge Products and Equipment, LLC.]**
 6. **[Egan Visual]**
 7. **[ghent; a GMi Company]**
 8. **[K-Pro Specialty Products]**
 9. **[MooreCo Inc]**
 10. **[Peter Pepper Products, Inc]**
 11. **[Platinum Visual Solutions]**
 12. **<Insert manufacturer's name>**

- C. Visual Display Conference Units: Factory-fabricated units consisting of hinged-door wood cabinet with perimeter face frame, sides, and back; not less than **3-inch (75-mm)** interior depth and designed for surface wall mounting. Fabricate inside of cabinet and cabinet doors with fixed visual display units.
1. Wood Cabinets: Fabricated from solid wood with integral, solid-wood marker tray. Fabricate hinged door panels with solid-wood frame and wood-veneer exterior surface.
 - a. Species and Finish: **[Red oak][Walnut][Mahogany]<Insert species>** with **[natural lacquered][oiled][stained]** finish.
 2. Plastic-Laminate Cabinets: Cabinet and hinged door panels fabricated from manufacturer's standard wood panels finished with high-pressure decorative laminate; with integral marker tray.
 - a. Color: **[Match Architect's sample][As indicated by referencing manufacturer's designations][As selected by Architect from full range of industry colors]<Insert color>**.
 3. Cabinet Corners: **[Square][Rounded]**.
 4. Hardware: Manufacturer's standard, full-height continuous hinges[, **wire door pulls**,] and door bumpers.
 5. Fixed Rear Panel: Manufacturer's standard **[porcelain-enamel][high-pressure markerboard laminate][glass]** markerboard panel.
 - a. Color: **[White][Beige][Tan][Match Architect's sample][As indicated by referencing manufacturer's designations][As selected by Architect from full range of industry colors]<Insert color>**.
 6. Inside Surface of Doors:
 - a. Same as fixed rear panel.
 - b. Tackboard panel consisting of **[natural-cork][plastic-impregnated-cork][vinyl-fabric][polyester-fabric]** facing on manufacturer's standard core.
 - c. Color: **[Match Architect's sample][As indicated by referencing manufacturer's designations][As selected by Architect from full range of industry colors]<Insert color>**.
 7. Projection Screen: Manufacturer's standard, pull-down, matte, white projection screen, not less than **8 inches (200 mm)** smaller in each direction than overall cabinet size, and mounted above rear visual display panel.
 8. Fluorescent Light: Manufacturer's standard, not less than **24 inches (610 mm)** long, and mounted above rear visual display panel.
 9. Width: **[48 inches (1219 mm)][As indicated on Drawings]<Insert dimension>**.
 10. Height: **[36 inches (914 mm)][48 inches (1219 mm)][72 inches (1829 mm)][As indicated on Drawings]<Insert dimension>**.
 11. Accessories: **[Cylinder lock][and][flip-chart pad clamp]**.

2.8 GLASS MARKERBOARDS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[A-1 Visual Systems]**
 2. **[Aarco Products, Inc.]**
 3. **[ADP Lemco]**

4. [ASI Visual Display Products]
5. [CAP Architectural]
6. [Claridge Products and Equipment, LLC.]
7. [Clarus Glassboards, LLC.]
8. [Dillmeier Glass]
9. [Dreamwalls by Gardner Glass Products]
10. [Egan Visual]
11. [ghent; a GMi Company]
12. [Krystal Glass Writing Boards, Inc.]
13. [Magna Visual Corp.]
14. [Marsh Industries, Inc.]
15. [MooreCo Inc]
16. [Peter Pepper Products, Inc]
17. [Platinum Visual Solutions]
18. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [A-1 Visual Systems]
2. [Aarco Products, Inc.]
3. [ADP Lemco]
4. [ASI Visual Display Products]
5. [CAP Architectural]
6. [Claridge Products and Equipment, LLC.]
7. [Clarus Glassboards, LLC.]
8. [Dillmeier Glass]
9. [Dreamwalls by Gardner Glass Products]
10. [Egan Visual]
11. [ghent; a GMi Company]
12. [Krystal Glass Writing Boards, Inc.]
13. [Magna Visual Corp.]
14. [Marsh Industries, Inc.]
15. [MooreCo Inc]
16. [Peter Pepper Products, Inc]
17. [Platinum Visual Solutions]
18. <Insert manufacturer's name>

C. Glass Markerboards: Fabricated of [6-mm tempered][or][6-mm tempered-laminated][low-iron][ultra-thin] glass[with steel backing for use with magnets].

1. Edge Treatment: Smooth polished edge with [rounded][eased] corners.
2. Frame: Aluminum trim in profile indicated.
3. Surface: [Glossy][Matte].
4. Color: [White][Gray][Translucent][Clear][Black][Red][Blue]<Insert color>.

D. Mounting:

1. Round, stainless steel standoffs, holding glass approximately [1 inch (25 mm)]<Insert dimension> from wall surface; mounted [through holes in][in notches in standoffs at top and bottom edges of] markerboard.
2. Concealed, Z-shaped brackets.
3. Manufacturer's standard adhesive or adhesive-foam tape mounting.

E. Graphics: Provide screen-printed graphics as indicated.

- F. Marker Tray: **[Glass][Aluminum]**, attached with **[stainless steel clips][magnet]**.
- G. Size: **[18 by 24 inches (457 by 610 mm)][24 by 36 inches (610 by 914 mm)][36 by 48 inches (914 by 1219 mm)][48 by 96 inches (1219 by 2438 mm)]<Insert dimensions>**.

2.9 DISPLAY RAILS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Aarco Products, Inc.]**
 - 2. **[ADP Lemco]**
 - 3. **[Aristocrat Industries, Inc.]**
 - 4. **[Bangor Cork]**
 - 5. **[Claridge Products and Equipment, LLC.]**
 - 6. **[EVERWhite Whiteboards]**
 - 7. **[ghent; a GMI Company]**
 - 8. **[K-Pro Specialty Products]**
 - 9. **[MooreCo Inc]**
 - 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Aarco Products, Inc.]**
 - 2. **[ADP Lemco]**
 - 3. **[Aristocrat Industries, Inc.]**
 - 4. **[Bangor Cork]**
 - 5. **[Claridge Products and Equipment, LLC.]**
 - 6. **[EVERWhite Whiteboards]**
 - 7. **[ghent; a GMI Company]**
 - 8. **[K-Pro Specialty Products]**
 - 9. **[MooreCo Inc]**
 - 10. **<Insert manufacturer's name>**
- C. Aluminum Display Rail: Manufacturer's standard, extruded-aluminum display rail with **[plastic-impregnated-cork]<Insert material>** tackable insert, **[and continuous paper holder,]** designed to hold accessories.
- D. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.
 - 1. Aluminum Finish: **[Clear anodic]<Insert description>** finish.
- E. Wood Display Rail: Manufacturer's standard wood display rail with **[plastic-impregnated-cork]<Insert material>** insert.
 - 1. Finish: **[Natural oak]<Insert finish>**.
- F. Tackable Insert Color: **[Tan][Gray][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
- G. Size: **[1 inch (25 mm)][2 inches (50 mm)][3 inches (75 mm)]** high by length indicated on Drawings.
- H. End Stops: **[Aluminum][Not required]**.

I. Accessories:

1. **[Metal][Plastic] Map Hooks:** Include **[two]<Insert number>** map hooks per **[room][20 feet (6 m)]<Insert dimension>[of installed display rail]**.
2. **Roller Brackets:** Include **[two]<Insert number>** roller brackets per **[room][20 feet (6 m)]<Insert dimension>[of installed display rail]**.
3. **Flag Holders:** Include **[one]<Insert number>** flag holder per **[room][20 feet (6 m)]<Insert dimension>[of installed display rail]**.

2.10 NATURAL-SLATE CHALKBOARDS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **<Insert, in separate subparagraphs, manufacturer's name>.**

B. Natural Slate: Select grade, resurfaced, natural slate; free from ribbons and other natural marks that impair their functional use and durability as a writing surface.

1. Thickness: Not less than **1/4 inch (6 mm)** or more than **3/8 inch (9.5 mm)** thick with maximum deviation of **1/16 inch (1.6 mm)** when an average thickness of at least **1/4 inch (6 mm)** is maintained.

C. Surface slate panels to a natural plane. Grind and hone to smooth, uniform finish equivalent to that obtained by minimum 180 grit and maximum 220 grit.

1. Cut joints straight and true. Space joints symmetrically. Fit and match panels before shipment to provide continuous, uniform writing surface.
2. Provide writing surface free of tooling marks, pits, chipping, scratches, and surface spalls in excess of those that can be easily corrected; and free of surface-applied stain, dye, or other artificial coloring.
3. Length: Furnish panels approximately equal in length with permissible variation not more than **3 inches (75 mm)** in either direction of equal spacing. Allow **1/4-inch (6-mm)** clearance at trim in length and width for fitting. Provide lengths of panels in each space as follows:
 - a. Up to **5 feet (1.5 m)**; one panel.
 - b. More than **5 feet (1.5 m)** but less than **9 feet (2.7 m)**; two panels.
 - c. More than **9 feet (2.7 m)** but less than **13.5 feet (4.1 m)**; three panels.
 - d. More than **13.5 feet (4.1 m)** but less than **18 feet (5.5 m)**; four panels.
 - e. More than **18 feet (5.5 m)** but less than **22.5 feet (6.9 m)**; five panels.
 - f. More than **22.5 feet (6.9 m)** but less than **27 feet (8.2 m)**; six panels.

D. Aluminum: Fabricated from not less than **0.062-inch- (1.57-mm-)** thick, extruded aluminum; **[of size and shape indicated on Drawings]<Insert size and shape>; [snap-on type with no visible screws or exposed joints][screw-on type with Phillips flat-head screws]**.E. Wood Trim: Comply with requirements specified in **[Section 062023 "Interior Finish Carpentry."][Section 064023 "Interior Architectural Woodwork."]**

2.11 CHALKBOARD PANELS

A. Porcelain-Enamel Chalkboard Panels: High-pressure factory-laminated chalkboard panels of balanced

three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with matte finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Face Sheet Thickness: **[0.021 inch (0.53 mm)][0.013 inch (0.33 mm)]** uncoated base metal thickness.
 2. Manufacturer's Standard Core: Minimum **1/4 inch (6 mm)** thick, with manufacturer's standard moisture-barrier backing.
 3. Hardboard Core: **1/4 inch (6 mm)** thick; with **[0.005-inch- (0.127-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.0129-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 4. Particleboard Core: **3/8 inch (9.5 mm)** thick; with **[0.005-inch- (0.127-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.0129-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 5. Fiberboard Core: **[3/8 inch (9.5 mm)][1/2 inch (13 mm)]** thick; with **[0.001-inch- (0.025-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.0129-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 6. MDF Core: **7/16 inch (11 mm)** thick; with manufacturer's standard moisture-barrier backing.
 7. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
- B. High-Pressure Chalkboard Laminate Panels: Factory-laminated chalkboard panels of balanced three-ply construction, consisting of backing, fiberboard core material, and high-pressure chalkboard laminate writing surface.
- C. Melamine Chalkboard Panels: Fabricated from **1/4-inch- (6-mm-)** thick, sealed and primed hardboard core permanently bonded with thermally fused, melamine-impregnated decorative paper writing surface complying.
- D. Painted-Finish Chalkboard Panels: Fabricated from **[two plies of] 1/4-inch- (6-mm-)** thick, treated, tempered hardboard core permanently surfaced with manufacturer's standard, heat-cured organic coating formulated for chalk-receptive matte finish.

2.12 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with **[high][low]**-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
1. Face Sheet Thickness: **[0.021 inch (0.53 mm)][0.013 inch (0.33 mm)]** uncoated base metal thickness.
 2. Manufacturer's Standard Core: Minimum **1/4 inch (6 mm)** thick, with manufacturer's standard moisture-barrier backing.
 3. Hardboard Core: **1/4 inch (6 mm)** thick; with **[0.005-inch- (0.127-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.013-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 4. Particleboard Core: **[3/8 inch (9.5 mm)][1/2 inch (13 mm)]** thick; with **[0.005-inch- (0.127-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.013-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 5. Fiberboard Core: **[3/8 inch (9.5 mm)][1/2 inch (13 mm)]** thick; with **[0.001-inch- (0.025-mm-) thick, aluminum foil][0.015-inch- (0.38-mm-) thick, aluminum sheet][0.013-inch- (0.33-mm-) thick, galvanized-steel sheet]** backing.
 6. MDF Core: **7/16 inch (11 mm)** thick; with manufacturer's standard moisture-barrier backing.
 7. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

10 - Specialties

- B. High-Pressure Markerboard Laminate Panels: Factory-laminated markerboard panel of three-ply construction, consisting of backing, fiberboard core material, and high-pressure markerboard laminate writing surface.
- C. Melamine Markerboard Panels: Fabricated from **1/4-inch- (6-mm-)** thick, sealed and primed hardboard panels permanently bonded with thermally fused, melamine-impregnated decorative paper writing surface.

2.13 TACKBOARD PANELS

- A. Tackboard Panels:
 - 1. Facing:
 - a. **[1/16-inch- (1.6-mm-) thick],[1/8-inch- (3-mm-) thick],[1/4-inch- (6-mm-) thick],[natural cork][plastic-impregnated cork].**
 - b. **[Vinyl][Polyester]** fabric.
 - c. **[Vinyl][Polyester]** fabric factory laminated to **[1/16-inch- (1.6-mm-)][1/8-inch- (3-mm-)][1/4-inch- (6-mm-)]** thick, cork sheet.
 - d. Recycled rubber, **0.44 inch (11 mm)** thick; with **[tan][red][green][grey][blue]** color flecks.
 - 2. Core:
 - a. Manufacturer's standard.
 - b. **[3/8-inch- (9.5-mm-)][7/16-inch- (11-mm-)]** thick fiberboard.
 - c. **1/4-inch- (6-mm-)** thick **[hardboard][or][particleboard].**

2.14 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. High-Pressure Decorative Laminate: ISO 4586-3.
- C. High-Pressure Markerboard Laminate: Complying with physical testing requirements of ISO 4586-3.
- D. High-Pressure Chalkboard Laminate: Complying with physical testing requirements of ISO 4586-3.
- E. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish[; **with surface-burning characteristics indicated**].
- F. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout[; **with surface-burning characteristics indicated**].
- G. Vinyl Fabric: Mildew resistant, washable, complying with ASTM F793/F793M, Type II, **[burlap weave]<Insert texture or pattern>**; weighing not less than **13 oz./sq. yd. (440 g/sq. m)**; with surface-burning characteristics indicated.
- H. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than **15 oz./sq. yd. (508 g/sq. m)**; with surface-burning characteristics indicated.

- I. Composite Wood Products: Products shall be made without urea formaldehyde.
- J. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- K. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- L. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- M. Composite Wood Products: Products shall be made without urea formaldehyde.
- N. Hardboard: ANSI A135.4, tempered.
- O. Particleboard: ANSI A208.1, Grade M-1.
- P. MDF: ANSI A208.2, Grade 130.
- Q. Fiberboard: ASTM C208 cellulosic fiber insulating board.
- R. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- S. Extruded Aluminum: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- T. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
 - 1. Adhesives shall have a VOC content of [50]<Insert value> g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m,

and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- U. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in [Section 099123 "Interior Painting"]<Insert Section number and title> and recommended in writing by visual display unit manufacturer for intended substrate.

2.15 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.16 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.

- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive **[visual display units][direct-applied, floor-to-ceiling visual display assemblies]** and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, **[balanced around center of board, as acceptable to Architect][as indicated on approved Shop Drawings]**.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies:
 - 1. Adhere to wall surfaces with **[egg-size]<Insert coverage>** adhesive gobs at **16 inches (400 mm)** o.c., horizontally and vertically.
 - 2. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than **16 inches (400 mm)** o.c. Secure tops and bottoms of boards to walls.
- D. Natural-Slate Chalkboards: Align and level joints between adjoining panels, and apply manufacturer's recommended joint-filler compound. Hone and finish joints to continuous even plane.
- E. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
 - 1. Mounting Height **[for Grades K through 3]<Insert description>**: **[24 inches (610 mm)]<Insert dimension>** above finished floor to top of chalktray.
 - 2. Mounting Height **[for Grades 4 through 6]<Insert description>**: **[28 inches (711 mm)]<Insert dimension>** above finished floor to top of chalktray.
 - 3. Mounting Height **[for Grades 7 and Higher]<Insert description>**: **[36 inches (914 mm)]<Insert dimension>** above finished floor to top of chalktray.
- F. Display Rails: Install rails at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than **16 inches (400 mm)** o.c.
 - 1. Mounting Height: **[48 inches (1219 mm)][60 inches (1524 mm)][72 inches (1829 mm)]<Insert**

dimension> above finished floor to top of rail.

- G. Floor-to-Ceiling Markerboard Panels: Attach panels to wall surface with **[egg-size]<Insert coverage>** adhesive gobs at **16 inches (400 mm)** o.c., horizontally and vertically.
 - 1. Join adjacent panels with concealed steel splines for smooth alignment.
 - 2. Join adjacent panels with exposed, H-shaped aluminum trim painted to match wall panel.
- H. Floor-to-Ceiling Tackboard Panels: Attach panels to wall surface with **[egg-size]<Insert coverage>** adhesive gobs at **16 inches (400 mm)** o.c., horizontally and vertically.
 - 1. Install wrapped-edge panels with butt joints between adjacent wall panels.
 - 2. Join adjacent panels with exposed, H-shaped aluminum trim covered with same fabric as wall panels.
- I. Rail Support System: Install horizontal support rail at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall with fasteners at **12 inches (300 mm)** o.c.
 - 1. Mounting Height: **[72 inches (1829 mm)]<Insert dimension>** above finished floor to top of rail.
 - 2. Hang visual display units on rail support system.
- J. Modular Support System: Install adjustable standards at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Install standards at **48 inches (1200 mm)** o.c., vertically aligned and plumb, and attached to wall with fasteners at **12 inches (300 mm)** o.c.
 - 1. Mounting Height: **[12 inches (305 mm)]<Insert dimension>** above finished floor to bottom of standard.
 - 2. Install single-slotted standard at each end of each run of standards and double-slotted standards at intermediate locations.
 - 3. Provide locking screw at top corner of visual display board at each standard.
 - 4. Hang visual display units on modular support system.
- K. Sliding Visual Display Units: Install units at mounting heights indicated. Attach to wall framing with fasteners at not more than **16 inches (400 mm)** o.c.
 - 1. Adjust panels to operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- L. Visual Display Conference Units: Install units at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with **[fasteners through back of cabinet][concealed brackets screwed to wall][concealed wood cleats screwed to wall]**.
 - 1. Mounting Height: **[72 inches (1829 mm)]<Insert dimension>** above finished floor to top of cabinet.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.



3.5 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain motorized, sliding visual display units.

END OF SECTION 10 11 00 00



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Task	Specification	Specification Description
10 11 13 00	10 11 00 00	Visual Display Units
10 11 13 13	10 11 00 00	Visual Display Units
10 11 13 33	10 11 00 00	Visual Display Units
10 11 16 00	10 11 00 00	Visual Display Units
10 11 16 13	10 11 00 00	Visual Display Units
10 11 16 33	10 11 00 00	Visual Display Units
10 11 16 53	10 11 00 00	Visual Display Units
10 11 23 00	10 11 00 00	Visual Display Units
10 11 23 13	10 11 00 00	Visual Display Units



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SECTION 10 12 00 00 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bulletin boards.
2. Display cases.

B. Related Requirements:

1. **[Section 062023 "Interior Finish Carpentry"]****[Section 064100 "Architectural Wood Casework"]****[Section 064101 "Architectural Wood Casework (NAAWS Standard)"]** for custom wood **[bulletin boards]****[and]****[display cases]**.
2. Section 097723 "Fabric-Wrapped Panels" for tackable, fabric-covered wall panels.
3. Section 101100 "Visual Display Units" for tackboards.
4. Section 101300 "Directories" for boards with changeable messages or changeable letters and for bulletin boards within built-in directories.

1.2 DEFINITIONS

- A. Bulletin Board: Glazed cabinet with tackboard panel, without shelves, typically of shallow depth for display of paper documents.
- B. Display Case: Glazed cabinet with **[tackboard panel back surface and]** adjustable shelves.
- C. Tackboard Panel: A material for holding push-pins or tacks, typically consisting of a facing such as fabric, vinyl, or cork; adhered to a substrate such as fiberboard, hardboard, or particleboard.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]**<Insert location>.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for **[display cases]****[and]****[bulletin boards]**. Include furnished specialties and accessories.
2. Include electrical characteristics for illuminated **[display cases]****[and]****[bulletin boards]**.

B. Shop Drawings: For **[display cases]****[and]****[bulletin boards]**.

1. Include plans, elevations, sections, and attachment details.
2. Show location of seams and joints in tackboard panels.
3. Include sections of typical trim members.



4. Include diagrams for wiring of illuminated **[display cases][and][bulletin boards]**.
- C. Samples: For each exposed product and for each color and texture specified; not less than **8-1/2 by 11 inches (215 by 280 mm)** for tackboard panels and **6 inches (150 mm)** long for trim with factory finish.
- D. Samples for Initial Selection: For each type of exposed finish.
 1. Include Samples of tackboard panels[, **header panel**] and factory-finished trim involving color finish selection.
- E. Samples for Verification: For each type of exposed finish for the following:
 1. Tackboard Panel: Not less than **8-1/2 by 11 inches (215 by 280 mm)**, with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: **6-inch- (150-mm-)** long sections of each trim profile[**including corner section**].
- F. Sustainable Design Submittals:
 1. Laboratory Test Reports: For adhesives, indicating compliance with VOC requirements in the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 3. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For **[fabrics][tackboard panels]**, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For **[display cases][and][bulletin boards]** to include in maintenance manuals.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install **[display cases][and][bulletin boards]** for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain **[display cases][and][bulletin boards]** from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25]<Insert value>** or less.
 - 2. Smoke-Developed Index: **[50][450]<Insert value>** or less.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 BULLETIN BOARDS

- A. Bulletin Boards:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A-1 Visual Systems]**
 - b. **[Aarco Products, Inc.]**
 - c. **[ADP Lemco]**
 - d. **[ASI Visual Display Products]**
 - e. **[Aywon]**
 - f. **[C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
 - g. **[CIG JAN Products, Ltd.]**
 - h. **[Claridge Products and Equipment, LLC.]**
 - i. **[ghent; a GMi Company]**
 - j. **[Marsh Industries, Inc.]**
 - k. **[MooreCo Inc]**
 - l. **[Nelson-Harkins Industries]**
 - m. **[Peter Pepper Products, Inc]**
 - n. **[Platinum Visual Solutions]**
 - o. **[Poblocki Sign Company, LLC]**
 - p. **[Pyramid Presentation Products]**
 - q. **[Signature, Inc.]**
 - r. **[Swingframe Mfg.; a division of Access Display Group, Inc.]**
 - s. **[Tablet & Ticket Co. (The)]**
 - t. **[Visiontron Corp.]**
 - u. **[Vomar Products, Inc]**
 - v. **[Waddell; a GMi Company]**
 - w. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A-1 Visual Systems]**
 - b. **[Aarco Products, Inc.]**
 - c. **[ADP Lemco]**
 - d. **[ASI Visual Display Products]**
 - e. **[Aywon]**
 - f. **[C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
 - g. **[CIG JAN Products, Ltd.]**

- h. [Claridge Products and Equipment, LLC.]
 - i. [ghent; a GMi Company]
 - j. [Marsh Industries, Inc.]
 - k. [MooreCo Inc]
 - l. [Nelson-Harkins Industries]
 - m. [Peter Pepper Products, Inc]
 - n. [Platinum Visual Solutions]
 - o. [Poblocki Sign Company, LLC]
 - p. [Pyramid Presentation Products]
 - q. [Signature, Inc.]
 - r. [Swingframe Mfg.; a division of Access Display Group, Inc.]
 - s. [Tablet & Ticket Co. (The)]
 - t. [Visiontron Corp.]
 - u. [Vomar Products, Inc]
 - v. [Waddell; a GMi Company]
 - w. <Insert manufacturer's name>
3. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard panel on back inside surface and operable glazed doors at front.
- a. Frame and Cabinet Profile: [Square][Rounded] frame section with [square][rounded] cabinet corners.
 - b. Mounting: [Surface mounted][Recessed].
 - c. Size:
 - 1) As indicated on Drawings.
 - 2) [48 inches (1200 mm)]<Insert dimension> wide by [36 inches (910 mm)]<Insert dimension> high by [4 inches (100 mm)]<Insert dimension> deep.
4. Aluminum-Framed Cabinet: Extruded aluminum; with [clear anodic][color anodic][manufacturer's standard baked-enamel or powder-coat] finish.
- a. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
5. Wood-Framed Cabinet: [Red oak][Maple][Walnut][Manufacturer's standard species]<Insert species> with [natural lacquered][oiled][stained] finish.
6. Exterior Bulletin Boards: Aluminum-framed units of weather-resistant construction; with vents to dissipate trapped moisture, weather-resistant tackboard panel, and weather-stripped hinged doors.
7. Glazed Sliding Doors: [Tempered glass][Clear acrylic sheet]<Insert glazing>; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
- a. Thickness: Not less than [5 mm][6 mm]<Insert dimension> thick.
 - b. Number of Doors: [One][Two][Three][As indicated on Drawings]<Insert number>.
8. Glazed Hinged Doors: [Tempered glass][Clear acrylic sheet]<Insert glazing>; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
- a. Thickness: Not less than [5 mm][6 mm]<Insert dimension> thick.
 - b. Number of Doors: [One][Two][Three][As indicated on Drawings]<Insert number>.

9. Header Panel: **[Nonilluminated; with opaque][Illuminated; with translucent]** acrylic sheet panel set within overall cabinet frame; with matching frame that separates header panel from bulletin board.
 - a. Graphic Content and Style: Provide header panel copy that complies with requirements indicated on **[Drawings][artwork supplied on electronic media by Architect]** for size, style, spacing, content, height, location, material, and colors of graphics.
 - b. Color: **[Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
10. Illumination System: Concealed top-lighting system consisting of fluorescent-strip fixtures. Include lamps and internal wiring with single, concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - a. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
Provide exterior ballasts for exterior bulletin boards.]
 - 1) Electrical Characteristics: Single-phase, **[120][277]** V.
11. Back Panel: Manufacturer's standard **[natural-cork][plastic-impregnated-cork][vinyl-fabric-faced][or][polyester-fabric-faced]** tackboard panel.
12. Natural-Cork Back Panel: Natural-cork tackboard panel **<Insert designation>**.
13. Plastic-Impregnated Back Panel: Plastic-impregnated-cork tackboard panel **<Insert designation>**.
14. Vinyl Back Panel: Vinyl-fabric-faced tackboard panel **<Insert designation>**.
15. Polyester Back Panel: Polyester-fabric-faced tackboard panel **<Insert designation>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.

2.4 DISPLAY CASES

A. Display Cases:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A-1 Visual Systems]**
 - b. **[Aarco Products, Inc.]**
 - c. **[ADP Lemco]**
 - d. **[ASI Visual Display Products]**
 - e. **[Aywon]**
 - f. **[CIG JAN Products, Ltd.]**
 - g. **[Claridge Products and Equipment, LLC.]**
 - h. **[ghent; a GMi Company]**
 - i. **[Peter Pepper Products, Inc]**
 - j. **[Platinum Visual Solutions]**
 - k. **[Poblocki Sign Company, LLC]**
 - l. **[Pyramid Presentation Products]**
 - m. **[Tablet & Ticket Co. (The)]**
 - n. **[Waddell; a GMi Company]**
 - o. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A-1 Visual Systems]**
 - b. **[Aarco Products, Inc.]**
 - c. **[ADP Lemco]**
 - d. **[ASI Visual Display Products]**
 - e. **[Aywon]**
 - f. **[CIG JAN Products, Ltd.]**
 - g. **[Claridge Products and Equipment, LLC.]**
 - h. **[ghent; a GMi Company]**
 - i. **[Peter Pepper Products, Inc]**
 - j. **[Platinum Visual Solutions]**
 - k. **[Poblocki Sign Company, LLC]**
 - l. **[Pyramid Presentation Products]**
 - m. **[Tablet & Ticket Co. (The)]**
 - n. **[Waddell; a GMi Company]**
 - o. **<Insert manufacturer's name>**

3. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - a. Display Case Cabinet: **[Extruded aluminum][Hardwood veneer plywood]**.
 - 1) Veneer Species: **[Birch][Maple][Red oak][Walnut][Manufacturer's standard species]<Insert species>** with **[natural lacquered][oiled][stained]** finish.
 - b. Face Frame:
 - 1) Aluminum.
 - 2) **[Wood, species to match interior of cabinet box][Birch][Maple][Red oak][Walnut][Manufacturer's standard hardwood species]<Insert species>** with **[natural lacquered][oiled][stained]** finish.
 - c. Aluminum Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - 1) Color: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.

4. Surface-Mounted Display Case: Factory-fabricated display case; with finished interior, and glazed doors at front.
 - a. Hardwood-veneer-plywood bottom panel; glazed side panels; **[hardwood-veneer-plywood][glazed]** top panel; **[aluminum][hardwood]** face frame.
 - 1) Wood and Veneer Species: **[Birch][Maple][Red oak][Walnut][Manufacturer's standard species]<Insert species>** with **[natural lacquered][oiled][stained]** finish.
 - b. Extruded-aluminum top, bottom, and side panels.
 - c. Aluminum frame with glazed top[, **bottom,**] and side panels.
 - d. Hardwood frame:

- 1) Wood Species: **[Birch][Maple][Red Oak][Walnut][Manufacturer's standard hardwood species]<Insert species>** with **[natural lacquered][oiled][stained]** finish; glazed top[, **bottom,**] and side panels.
- e. Aluminum Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - 1) Color: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- f. Display Case Base: **[No base, for wall mounting][Legs, to match construction of frame][Full-height display case, with minimal base][Manufacturer's standard hardwood-plywood-veneer base, in species to match display case interior]**.
5. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - a. Thickness: Not less than **[5 mm][6 mm]<Insert dimension>** thick.
 - b. Number of Doors: **[Two][Three][As indicated on Drawings]<Insert number>**.
6. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
 - a. Thickness: Not less than **[5 mm][6 mm]<Insert dimension>** thick.
 - b. Number of Doors: **[One][Two][Three][As indicated on Drawings]<Insert number>**.
7. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - a. Shelf Depth: **[6 inches (150 mm)][8 inches (200 mm)][10 inches (250 mm)][12 inches (300 mm)]**.
 - b. Number of Shelves: **[Three][As indicated on Drawings]<Insert number>**.
8. Adjustable Shelf Standards and Supports: **[BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface][BHMA A156.9, B04071; with shelf rests, B04081; mounted on sides]**. Provide standards extending full height of display case.
9. Natural-Cork Back Panel: Natural-cork tackboard panel **<Insert designation>**.
10. Plastic-Impregnated Back Panel: Plastic-impregnated-cork tackboard panel **<Insert designation>**.
11. Vinyl Back Panel: Vinyl-fabric-faced tackboard panel **<Insert designation>**.
12. Polyester Back Panel: Polyester-fabric-faced tackboard panel **<Insert designation>**.
13. Hardwood Back Panel: Hardwood veneer to match display case construction.
14. Back Panel: **<Insert type of material>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
15. Illumination System: Concealed top-lighting system consisting of fluorescent-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - a. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
 - 1) Electrical Characteristics: Single phase, **[120][277]** V.

16. Size: **[As indicated on Drawings]**[48 inches (1200 mm)] wide, by [60 inches (1500 mm)] high, by [8 inches (200 mm)][16 inches (400 mm)][24 inches (600 mm)] deep.

2.5 TACKBOARD PANELS

A. Natural-Cork Tackboard Panel **<Insert designation>**:

1. **1/16-inch- (1.6-mm-)** thick, natural-cork sheet factory laminated to [3/8-inch- (9.5-mm-)][7/16-inch- (11-mm-)] thick, fiberboard backing.
2. **1/8-inch- (3-mm-)** thick, natural-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
3. **1/4-inch- (6-mm-)** thick, natural-cork sheet factory laminated to 1/4-inch- (6-mm-) thick, [hardboard][particleboard] backing.

B. Plastic-Impregnated-Cork Tackboard Panel **<Insert designation>**:

1. **1/8-inch- (3-mm-)** thick, plastic-impregnated-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
2. **1/4-inch- (6-mm-)** thick, plastic-impregnated-cork sheet factory laminated to 1/4-inch- (6-mm-) thick, [hardboard][particleboard] backing.

C. Vinyl-Fabric-Faced Tackboard Panel **<Insert designation>**:

1. Vinyl fabric factory laminated to [3/8-inch- (9.5-mm-)][7/16-inch- (11-mm-)][1/2-inch- (13-mm-)] thick, fiberboard backing.
2. **1/16-inch- (1.6-mm-)** thick, vinyl-fabric-faced-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
3. **1/8-inch- (3-mm-)** thick, vinyl-fabric-faced-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
4. **1/4-inch- (6-mm-)** thick, vinyl-fabric-faced-cork sheet factory laminated to 1/4-inch- (6-mm-) thick, [hardboard][particleboard] backing.

D. Polyester-Fabric-Faced Tackboard Panel **<Insert designation>**:

1. Polyester fabric factory laminated to [3/8-inch- (9.5-mm-)][1/2-inch- (13-mm-)] thick, fiberboard backing.
2. **1/16-inch- (1.6-mm-)** thick, polyester-fabric-faced-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
3. **1/8-inch- (3-mm-)** thick, polyester-fabric-faced-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
4. **1/4-inch- (6-mm-)** thick, polyester-fabric-faced-cork sheet factory laminated to 1/4-inch- (6-mm-) thick, [hardboard][particleboard] backing.

2.6 MATERIALS

- A. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- B. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.

2. Particleboard: 0.09 ppm.
 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- C. Hardboard: ANSI A135.4, tempered.
 - D. Fiberboard: ASTM C208.
 - E. Particleboard: ANSI A208.1, Grade M-1.
 - F. Hardwood Plywood: HPVA HP-1.
 - G. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
 - H. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto burlap backing; with washable vinyl finish and integral color throughout.
 - I. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than **15 oz./sq. yd. (508 g/sq. m)**; with flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - J. Vinyl Fabric: ASTM F793/F793M, Type II, [**burlap weave**]<Insert texture and pattern>; weighing not less than **13 oz./sq. yd. (440 g/sq. m)**; with flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - K. Extruded-Aluminum Bars and Shapes: **ASTM B221 (ASTM B221M)**, Alloy 6063.
 - L. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.
 - M. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
 - N. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), colorless sheet with visible light transmittance of 92 percent measured in accordance with ASTM D1003.
 - O. Opaque Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet).
 - P. Translucent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished). Provide white-colored sheet unless otherwise indicated, of density required to produce uniform brightness and minimum halation effects.
 - Q. High-Pressure Plastic Laminate: ISO 4586-3.
 - R. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.
 - S. Adhesives: Use adhesives that comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - T. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.7 FABRICATION

- A. Fabricate **[bulletin boards][and][display cases]** to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for **[bulletin boards][and][display cases]**.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
 - 1. Mounting Height: **[72 inches (1830 mm)]<Insert dimension>** above finished floor to top of cabinet.
- B. Bulletin Boards: Attach units to wall surfaces with concealed clips, hangers, or grounds.
- C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than **16 inches (400 mm)** o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than **24 inches (600 mm)** o.c.
- D. Surface-Mounted Display Cases: Attach units to wall surfaces with concealed clips, hangers, or grounds fastened at not more than **16 inches (400 mm)** o.c. Secure tops and bottoms of display cases to walls.
- E. Floor-Mounted Display Cases: Attach display cases with **[bases][legs]** to floor with concealed anchors.
- F. Comply with requirements specified elsewhere for connecting illuminated **[bulletin boards][and][display cases]**.
- G. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended in writing by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 10 12 00 00



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Task	Specification	Specification Description
10 12 00 00	01 11 19 00	No Specification Required



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SECTION 10 13 00 00 - DIRECTORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonilluminated and front-illuminated message-strip directories.
2. Rear-illuminated message-strip directories.
3. Changeable-letter directories.

B. Related Requirements:

1. Section 101423 "Panel Signage" for panel-sign-type directories.
2. Section 101429 "Modular Signage" for directories using modular signage systems.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for directories.
2. Include furnished specialties and accessories.
3. Include electrical characteristics for illuminated directories.

B. Shop Drawings: For directories.

1. Include plans, elevations, sections, and attachment details.
2. Include sections of typical trim members.
3. Indicate layout directory, including header and message strips.
4. Include diagrams for power wiring.

C. Samples: For each exposed product and for each color and texture specified.

1. Trim: **6 inches (150 mm)** long for profile and color of factory finish.
2. Message Strip: Length as indicated for finished product for profile and mounting configuration.
3. Typeface Sample for size and font.
4. Letterboard Panel: Not less than **8-1/2 by 11 inches (215 by 280 mm)**.
5. Changeable Letters: Six full-size letters indicating size and font.

D. Samples for Initial Selection: For each type of directory.

1. Message Strip: Typeface Sample for size and font.
2. Header Panel: Typeface Sample for size and font, and for color selection.
3. Trim: For profile and samples color of factory finish.



4. Letterboard: Fabric swatches for color.
5. Changeable Letters: For each size and font available.

E. Samples for Verification: For each type of directory.

1. Trim: **6-inch- (150-mm-)** long sections of each trim profile[**including corner section**], in color selected.
2. Message Strips: Full-size Samples of message strips in color selected with Sample of selected typeface and size.
3. Letterboards: Not less than **8-1/2 by 11 inches (215 by 280 mm)**, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
4. Letters: Full-size Samples of changeable letters of each size and font specified.

F. Message-Strip Schedule: For each message strip, indicating letter size, font, spacing, indents, text copy, and graphics.[**Use same designations indicated on Drawings.**]

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each directory, for tests performed by **[manufacturer and witnessed by a qualified testing agency][a qualified testing agency]**, for surface-burning characteristics of letterboards.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For directories to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Message Strips: Full-size blank strips equal to **[10]<Insert number>** percent of number installed for each size indicated, but no fewer than **[20]<Insert number>** strips.
 2. Paper Message-Strip Stock: Colored[, **perforated**] paper stock for printing paper message-strip inserts using manufacturer-supplied software, equal to **[2]<Insert number>** times message-strip capacity of directory.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: **[25]<Insert value>** or less.
 2. Smoke-Developed Index: **[50][450]<Insert value>** or less.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 NONILLUMINATED AND FRONT-ILLUMINATED MESSAGE-STRIP DIRECTORIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[APCO Graphics, Inc]**
 2. **[ASI Sign Systems, Inc]**
 3. **[Nelson-Harkins Industries]**
 4. **[Poblocki Sign Company, LLC]**
 5. **[Signature, Inc.]**
 6. **[Tablet & Ticket Co. (The)]**
 7. **[Vomar Products, Inc]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[APCO Graphics, Inc]**
 2. **[ASI Sign Systems, Inc]**
 3. **[Nelson-Harkins Industries]**
 4. **[Poblocki Sign Company, LLC]**
 5. **[Signature, Inc.]**
 6. **[Tablet & Ticket Co. (The)]**
 7. **[Vomar Products, Inc]**
 8. **<Insert manufacturer's name>**
- C. Profiled Frame: **[Molded-opaque-acrylic or molded-fiberglass][Extruded-aluminum]** profiled frame at top and bottom, with sheet metal rear cover, housing changeable message strips in configuration indicated.
1. Frame:
 - a. Top and Bottom Profile: **[Square][Radius][Bevel]<Insert shape>**.
 - b. Side Trim: **[Aluminum angle][Bronze angle][Brass angle][Molded-opaque-acrylic or molded-fiberglass integral to frame]**.
 - c. Depth: Manufacturer's standard **[1-1/2- to 2-1/2-inch (38- to 64-mm)]<Insert dimensions>** frame depth.
 - d. Profile Face Dimension: **[4 inches (100 mm)][6 inches (152 mm)]<Insert dimension>** high.
 - e. Aluminum Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - f. Color: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
 2. Cover: Removable, clear acrylic sheet held in place by perimeter frame. Provide suction cup tool for cover removal.
 3. Number of Columns: **[Two][Three][Four]<Insert number>** columns of message strips.
 4. Mounting: Surface.
 5. Header: Copy applied to top section of profiled frame.
 6. Divider Color: **[Same as message strips][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
- D. Metal Frame: Directory with full perimeter metal frame and sheet metal rear cover, housing changeable

message strips in configuration indicated.

1. Perimeter Frame:
 - a. Material: **[Extruded aluminum][Brass][Bronze]**.
 - b. Profile: **[Square][Quarter round][Bevel]<Insert shape>**.
 - c. Corners: **[Square][Radius]**.
 - d. Depth: Manufacturer's standard **[1-3/4- to 2-3/4-inch (44- to 70-mm)]<Insert dimensions>** frame depth.
 2. Cover: **[Non-sectional single-piece cover with full-length concealed hinge, full width of directory.][Cover for each section of message strips with full-length concealed hinge.]**Equip with cylinder lock(s).
 - a. Frame: Same material and finish as perimeter frame.
 - b. Hinge Location: **[Side][Top, with hold-open bracket][Top, with gas-cylinder hold-open]**.
 - c. Glazing: **[Clear float glass][Clear tempered glass][Bronze-tinted tempered glass][Gray-tinted tempered glass][Clear acrylic sheet]**.
 3. Number of Columns: **[Two][Three][Four]<Insert number>** columns of message strips.
 4. Mounting: **[Surface][Recessed, with reveal and flange to cover perimeter of opening][Recessed, with reveal; without perimeter frame for fully finished opening][Recessed with reveal, with frame to cover opening return]**.
 5. Header Panel: Full width of directory, by **[4 inches (102 mm)][6 inches (152 mm)][8 inches (203 mm)]<Insert dimension>** high.
 6. Divider Strips: Provide divider strips between columns of message strips, and between header and message strips.
 - a. Color: **[Same as message strips][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
 7. Aluminum Finish: **[Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat]**.
 - a. Color: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>**.
 8. Brass Finish: **[Buffed][Medium satin][Fine matte][Statuary conversion coating]**.
 9. Bronze Finish: **[Buffed][Medium satin][Fine matte][Statuary conversion coating]**.
- E. Message Strips: Provide message strips compatible with directory system selected, with message copy indicated in message-strip schedule.

1. Type:
 - a. Opaque flat plastic strips, which slide into retainer channels on sides of directory, with screen-printed or vinyl-film copy.
 - b. Acrylic or high-pressure plastic-laminate strips with machine- or laser-engraved copy, which exposes contrasting core.
 - c. Flexible magnetic tape with screen-printed or vinyl-film copy.
 - d. Film-Insert Changeable Message Strips: Removable message strips fabricated from plastic film with **[vinyl][screen-printed]** lettering, held in interchangeable, interlocking plastic carriers.

2. Width: [7 inches (175 mm)][11 inches (280 mm)][14 inches (350 mm)][18 inches (457 mm)]<Insert dimension> long.
 3. Height: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension>.
 4. Color:
 - a. Message-Strip Background: [Black][Gray][Brown][White][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - b. Lettering: [White][Black][Gray][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 5. Lettering:
 - a. Letter Height: [3/16 inch (5 mm)][1/4 inch (6 mm)][3/8 inch (9.5 mm)]<Insert dimension>.
 - b. Font Style: [Arial Medium][Clarendon Medium][Optima Bold][As selected by Architect]<Insert style>.
 - c. Case: [All capitals][Initial capitals][Capitals and lowercase][As indicated on message-strip schedule].
 6. Header Graphics: Provide copy that complies with requirements indicated on [Drawings][artwork supplied on electronic media by Architect] for size, style, spacing, content, height, location, material, and colors of graphics.
 7. Graphics Panel: Screen-printed graphics or vinyl graphics laminated to opaque acrylic sheet; held in place by interchangeable, interlocking plastic carrier. Provide graphics that comply with requirements indicated on [Drawings][artwork supplied on electronic media by Architect] for size, style, spacing, content, height, location, material, and colors.
 8. Directory Overall Width: [24 inches (610 mm)][As indicated on Drawings]<Insert dimension>.
 9. Directory Overall Height: [36 inches (914 mm)][As indicated on Drawings]<Insert dimension>.
- F. Exterior Directories: Metal-framed directories of weather-resistant construction; with vents to dissipate trapped moisture, weather-resistant components, and weather-stripped hinged doors.
- G. Illumination System: Concealed top-lighting system consisting of [fluorescent][or][LED] fixtures. Include lamps and internal wiring with single, concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided. Provide angled message-strip section for more even illumination.
1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.[**Provide exterior ballasts for exterior directories.**]
 2. Electrical Characteristics: Single phase, [120][277] V.

2.3 REAR-ILLUMINATED MESSAGE-STRIP DIRECTORIES

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [APCO Graphics, Inc]
 2. [ASI Sign Systems, Inc]
 3. [Desk & Door Nameplate Co.]
 4. [Nelson-Harkins Industries]
 5. [Poblocki Sign Company, LLC]

6. [Signature, Inc.]
 7. [Tablet & Ticket Co. (The)]
 8. [Vomar Products, Inc]
 9. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [APCO Graphics, Inc]
 2. [ASI Sign Systems, Inc]
 3. [Desk & Door Nameplate Co.]
 4. [Nelson-Harkins Industries]
 5. [Poblocki Sign Company, LLC]
 6. [Signature, Inc.]
 7. [Tablet & Ticket Co. (The)]
 8. [Vomar Products, Inc]
 9. <Insert manufacturer's name>
- C. Rear-Illuminated Message-Strip Directory: Factory-fabricated unit consisting of changeable message strips held in place by retainer frame enclosed in manufacturer's standard [4-to-6-inch- (100-to-150-mm-) deep]<Insert dimensions> perimeter frame; with glazed cover, aluminum-sheet rear cover panel, and concealed rear-illumination system.
1. Frame:
 - a. Material: [Extruded aluminum][Brass][Bronze][Stainless steel].
 - b. Profile: [Square][Quarter round][Bevel]<Insert shape>.
 - c. Corners: [Square][Radius].
 2. Cover: Non-section, one-piece cover with concealed lock.
 - a. Cover Frame Material: Same material and finish as perimeter frame.
 - b. Cover Frame Profile: [Square][Radius][Bevel][Floating glass, with frame concealed behind glass][Suspended glass, with frame partially concealed behind glass].
 - c. Hinge Location: [Side][Top, with hold-open bracket][Top, with gas-cylinder hold-open].
 - d. Glazing: [Gray-tinted float glass][Gray-tinted tempered glass][Bronze-tinted acrylic sheet].
 3. Header Panel: Same material and color as changeable message strips. Provide copy that complies with requirements indicated on [Drawings][artwork supplied on electronic media by Architect] for size, style, spacing, content, height, location, material, and colors of graphics.
 4. Divider Color: Same as message strips.
 5. Exterior Directories: Metal-framed directories of weather-resistant construction; with vents to dissipate trapped moisture, weather-resistant components, and weather-stripped hinged doors.
 6. Film-Insert Message Strips: Removable, black, film-negative message strips in [7-inch- (175-mm-)][14-inch- (350-mm-)]<Insert dimension> long, interchangeable, interlocking plastic carriers.
 7. Engraved Changeable Message Strips: Machine- or laser-engraved copy in [7-inch- (175-mm-)][14-inch- (350-mm-)]<Insert dimension> long, interchangeable, interlocking, black, acrylic strips with transparent core.
 - a. Message-Strip Height: [3/8 inch (9.5 mm)][1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Letter Height: [3/16 inch (5 mm)][1/4 inch (6 mm)][3/8 inch (9.5 mm)][1/2 inch (13 mm)][5/8 inch (16 mm)]<Insert dimension>.

- c. Letter Style: **[Arial Medium][Clarendon Medium][Optima Bold][As selected by Architect]<Insert style>**.
- d. Letter Case: **[All capitals][Initial capitals][Capitals and lowercase][As indicated on message-strip schedule]**.
- 8. Graphics Panel: Same material and color as changeable message strips. Provide graphics that comply with requirements indicated on **[Drawings][artwork supplied on electronic media by Architect]** for size, style, spacing, content, height, location, material, and colors.
- 9. Rear-Illumination System: Provide removable and accessible **[fluorescent-strip][or][LED]** fixture system with reflective interior surfaces for uniform illumination of message strips **[and header panel]** with minimum halation and without light leaks. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - a. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label. **[Provide exterior ballasts for exterior directories.]**
 - b. Electrical Characteristics: Single phase, **[120][277]** V.
- 10. Aluminum Finish: **[Clear anodic][Color anodic][Plated]<Insert finish>**.
 - a. Color: **[Light bronze][Medium bronze][Dark bronze][Black][Gold][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 - b. Plating: **[Satin bronze][Mirror bronze][Bright chrome][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert finish>**.
- 11. Brass Finish: **[Buffed][Medium satin][Fine matte][Statuary conversion coating]**.
- 12. Bronze Finish: **[Buffed][Medium satin][Fine matte][Statuary conversion coating]**.
- 13. Stainless Steel Finish: **[ASTM A480/A480M No. 4][ASTM A480/A480M No. 8]**.
- 14. Width: **[As indicated on Drawings]<Insert dimension>**.
- 15. Height: **[As indicated on Drawings]<Insert dimension>**.
- 16. Mounting: **[Surface][Recessed, with reveal and flange to cover perimeter of opening][Recessed, with reveal; without perimeter frame for fully finished opening][Recessed, with reveal; with frame to cover opening return]**.

2.4 CHANGEABLE-LETTER DIRECTORIES

- A. Enclosed-Face, Changeable-Letter Directory : Factory-fabricated unit consisting of manufacturer's standard, **2-inch- (50-mm-)** deep, perimeter frame with **[fixed][removable]** letterboard on back inside surface and with **[glazed doors][lift-off, glazed cover]**.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aarco Products, Inc.]**
 - b. **[ASI Sign Systems, Inc]**
 - c. **[C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
 - d. **[CIG JAN Products, Ltd.]**
 - e. **[Claridge Products and Equipment, LLC.]**
 - f. **[Desk & Door Nameplate Co.]**
 - g. **[ghent; a GMI Company]**

- h. [Marsh Industries, Inc.]
 - i. [MooreCo Inc]
 - j. [Nelson-Harkins Industries]
 - k. [Peter Pepper Products, Inc]
 - l. [Platinum Visual Solutions]
 - m. [Pyramid Presentation Products]
 - n. [Signature, Inc.]
 - o. [Swingframe Mfg.; a division of Access Display Group, Inc.]
 - p. [Tablet & Ticket Co. (The)]
 - q. [United Visual Products, Inc.]
 - r. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Aarco Products, Inc.]
 - b. [ASI Sign Systems, Inc]
 - c. [C.R. Laurence Co., Inc.; CRH Americas, Inc.]
 - d. [CIG JAN Products, Ltd.]
 - e. [Claridge Products and Equipment, LLC.]
 - f. [Desk & Door Nameplate Co.]
 - g. [ghent; a GMi Company]
 - h. [Marsh Industries, Inc.]
 - i. [MooreCo Inc]
 - j. [Nelson-Harkins Industries]
 - k. [Peter Pepper Products, Inc]
 - l. [Platinum Visual Solutions]
 - m. [Pyramid Presentation Products]
 - n. [Signature, Inc.]
 - o. [Swingframe Mfg.; a division of Access Display Group, Inc.]
 - p. [Tablet & Ticket Co. (The)]
 - q. [United Visual Products, Inc.]
 - r. <Insert manufacturer's name>
 3. Aluminum Perimeter Frame: Extruded aluminum[with weather-resistant backing for exterior use].
 - a. Perimeter Frame Profile: [Square][Half round][Quarter round]<Insert shape>.
 - b. Perimeter Frame Corners: [Square][Radius].
 - c. Finish: [Clear anodic][Color anodic][Manufacturer's standard baked enamel or powder coat].
 - 1) Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 4. Wood Perimeter Frame: [Red oak][Walnut] with [natural lacquered][oiled][stained] finish.
 - a. Perimeter Frame Profile: [Square][Half round][Quarter round]<Insert shape>.
 - b. Perimeter Frame Corners: [Square][Radius].
 5. Glazed Sliding Doors: Unframed, clear-tempered-glass doors supported on nylon or ball-bearing rollers in extruded-aluminum top and bottom track, with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.

- a. Door Track: Same finish on exposed surfaces as perimeter frame.
 - b. Number of Doors: **[Two][Three][As indicated on Drawings]<Insert number>**.
6. Glazed Hinged Doors: Clear **[acrylic sheet][tempered glass]** set in door frame equipped with full-height continuous hinge and cylinder lock with two keys.
 - a. Door Frame: Same material and finish as perimeter frame.
 - b. Number of Doors: **[One][Two][Three][As indicated on Drawings]<Insert number>**.
7. Lift-off Cover: Clear **[acrylic sheet][tempered glass]** set in frame that snaps into place. Fabricate frame from same material and finish as perimeter frame.
8. Header Panel: **[Nonilluminated; with opaque][Illuminated; with translucent]** acrylic sheet panel set within overall perimeter frame; with matching frame that separates header panel from letterboard.
 - a. Graphic Content and Style: Provide header panel copy that complies with requirements indicated on **[Drawings][artwork supplied on electronic media by Architect]** for size, style, spacing, content, height, location, material, and colors.
 - b. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
9. Letterboard: Manufacturer's standard **[felt][vinyl][rubber]**-covered panel material, with grooves spaced at **1/4 inch (6 mm)** o.c. to receive changeable letters.
 - a. Color: **[Black][Red][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
10. Letters: Molded plastic with tabs for engaging grooves in letterboard. Provide manufacturer's standard assortment of not less than **[300]<Insert number>** characters for each size, style, color, and case required; include letters, numbers, and characters. Package letters in compartmentalized carrying box.
 - a. Height: **[3/8 inch (9.5 mm)][1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (50 mm)][3 inches (75 mm)]<Insert dimension>** to top of capitals.
 - b. Style: **[Arial][Gothic][Roman][As selected by Architect]<Insert style>**.
 - c. Color: **[White][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 - d. Case: **[All capitals][Capitals and lowercase]**.
11. Width: **[24 inches (610 mm)][As indicated on Drawings]<Insert dimension>**.
12. Height: **[36 inches (914 mm)][As indicated on Drawings]<Insert dimension>**.
13. Mounting: **[Recessed][Semirecessed][Surface]**.
14. Exterior Directories: Aluminum-framed units of weather-resistant construction; with vents to dissipate trapped moisture, weather-resistant letterboard, and weather-stripped hinged doors.
15. Illumination System: Concealed top-lighting system consisting of **[fluorescent][or][LED]** fixtures. Include lamps and internal wiring with single, concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - a. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
Provide exterior ballasts for exterior directories.
 - b. Electrical Characteristics: Single phase, **[120][277]** V.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: **ASTM B209 (ASTM B209M)**.
 - 2. Extruded Shapes: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- C. Copper-Alloy Brass Sheet: ASTM B36/B36M, Alloy UNS No. C26000 (cartridge brass, 70 percent copper).
- D. Copper-Alloy Bronze Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
- E. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3.
- F. Gray-Tinted Float Glass: ASTM C1036; Type I (transparent glass, flat); Class 2 (tinted, heat absorbing, and light reducing), Quality q3 (glazing select); gray-tinted monolithic glass with a maximum luminous transmittance of 14 percent.
- G. Bronze-Tinted Float Glass: ASTM C1036; Type I (transparent glass, flat); Class 2 (tinted, heat absorbing, and light reducing), Quality q3 (glazing select); bronze-tinted monolithic glass with a maximum luminous transmittance of 44 percent.
- H. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality q3, with exposed edges seamed before tempering.
- I. Tinted Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 2 (tinted), tint as indicated, Quality q3, with exposed edges seamed before tempering.
- J. Clear Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), colorless sheet with visible light transmittance of 92 percent measured in accordance with ASTM D1003.
- K. Bronze-Tinted Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished).
- L. Translucent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), white-colored sheet of density required to produce uniform brightness and minimum halation effects.
- M. Opaque Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), colors as indicated.
- N. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.6 FABRICATION

- A. Fabricate directories to requirements indicated for dimensions, design, and thickness and finish of materials. Use metals and shapes of thickness and reinforcement to produce flat surfaces, free of oil canning, and to impart strength for size, design, and application indicated.
- B. Fabricate directory cabinets and door frames with reinforced corners, mitered and welded to a hairline fit, with no exposed fasteners. Provide structural reinforcement to prevent racking and misalignment.
- C. Fabricate exterior directories with vents to permit evaporation of moisture trapped inside.
- D. Message-Strip Directories:
 - 1. Provide blank message strips for each carrier in entire directory.
 - 2. Provide message strips with wording and other designations for locations where wording is indicated. Include blank message strips as needed to fill out remainder of directory.
- E. Provide hold-open arms for doors of top-hinged directories.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**][**AA-M12C22A31, Class II, 0.010 mm**] or thicker.
- B. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**][**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.9 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: ASTM A480/A480M No. 4.

4. Mirrorlike Reflective, Nondirectional Polish: ASTM A480/A480M No. 8.

2.10 COPPER-ALLOY FINISHES

- A. Buffed Finish: M21 (Mechanical Finish: buffed, smooth specular).
 - B. Medium-Satin Finish: M32 (Mechanical Finish: directionally textured, medium satin).
 - C. Fine-Matte Finish: M42 (Mechanical Finish: nondirectional finish, fine matte).
 - D. Statuary Conversion Coating over Satin Finish: M32-C55 (Mechanical Finish: directionally textured, medium satin; Chemical Finish: conversion coating, sulfide).
1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated directories.
- C. Examine walls and partitions for proper backing for directories.
- D. Examine walls and partitions for suitable framing depth if recessed directories will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install directories with perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Mounting Height: Install directories at mounting heights indicated on Drawings, or if not indicated, at **72 inches (1829 mm)]<Insert dimension>** above finished floor to top of directory.
- C. Recessed Directories: Attach directories to wall framing with fasteners at not more than **16 inches (400 mm)** o.c. Attach aluminum trim over edges of recessed directories, and conceal grounds and clips.
- D. Surface-Mounted Directories: Attach directories to wall framing with concealed clips, hangers, or grounds fastened at not more than **16 inches (400 mm)** o.c. Secure both top and bottom of directories to walls.
- E. Comply with requirements specified elsewhere for connecting illuminated directories.



3.3 ADJUSTING AND CLEANING

- A. Adjust directory doors to operate smoothly without warp or bind and so that contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 10 13 00 00



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Task	Specification	Specification Description
10 13 11 00	10 11 00 00	Visual Display Units
10 13 11 00	10 13 00 00	Directories



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SECTION 10 14 16 00 - PLAQUES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal plaques.

B. Related Requirements:

1. Section 101423 "Panel Signage" and Section 101423.16 "Room-Identification Panel Signage" for plaques or signs similar to metal plaques, with or without frames, except that they are made of materials other than solid metal.
2. **[Section 142100 "Electric Traction Elevators"]****[Section 142400 "Hydraulic Elevators"]****[Section 143100 "Escalators"]****[Section 143200 "Moving Walks"]****[Section 144200 "Wheelchair Lifts"]** for code-required conveying equipment signage.
3. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
4. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
5. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.

1.2 ALLOWANCES

- A. Allowances for **[signage]****[plaques]****[and]****[plaques used for room identification]****<Insert item description>** are specified in Section 012100 "Allowances."
- B. **<Insert product or material>****[is]****[are]** part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.
 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting

materials.

- C. Shop Drawings: For plaques.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show plaque mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements[, **including raised characters and Braille**], and layout for each plaque at least [**half size**]<Insert scale>.
- D. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Plaques: [**Full-size Sample**][**Half-size Sample**]<Insert size>.
 - 2. Exposed Accessories: [**Full-size Sample**][**Half-size Sample**]<Insert size> of each accessory type.
 - 3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
- F. Product Schedule: For plaques. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [**Installer**][**and**][**manufacturer**].
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For plaques to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: [**Manufacturer of products**][**An entity that employs installers and supervisors who are trained and approved by manufacturer**].

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - 2. Warranty Period: [**Five**]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and]****[ICC A117.1]****<Insert requirement>**.

2.2 METAL PLAQUES

- A. Cast Plaque : Cast-metal plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.R.K. Ramos]**
 - b. **[ACE Sign Systems, Inc.]**
 - c. **[Erie Landmark Company; a division of Paul W. Zimmerman Foundaries, Inc.]**
 - d. **[Gemini Signage; Gemini, Inc.]**
 - e. **[Matthews International Corporation; Bronze Division]**
 - f. **[Metallic Arts]**
 - g. **[Signs & Decal Corp]**
 - h. **[Southwell Company (The)]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.R.K. Ramos]**
 - b. **[ACE Sign Systems, Inc.]**
 - c. **[Erie Landmark Company; a division of Paul W. Zimmerman Foundaries, Inc.]**
 - d. **[Gemini Signage; Gemini, Inc.]**
 - e. **[Matthews International Corporation; Bronze Division]**
 - f. **[Metallic Arts]**
 - g. **[Signs & Decal Corp]**
 - h. **[Southwell Company (The)]**
 - i. **<Insert manufacturer's name>**
3. Plaque Material: Cast **[aluminum]****[brass]****[bronze]****[zinc]****<Insert material>**.
4. Plaque Thickness: **[0.153 inch (3.89 mm)]****[0.25 inch (6.35 mm)]****[0.50 inch (12.7 mm)]****<Insert dimension>**.
5. Finishes:
 - a. Integral Metal Finish: **[Mill]****[Antique oxidized]****[Mill finish raised surface with dark oxidized background]****[As indicated by manufacturer's designation]****[Match Architect's sample]****[As selected by Architect from full range of industry finishes]****<Insert finish>**.
 - b. Integral Aluminum Finish: **[Clear anodized]****[Light bronze anodized]****[Medium bronze anodized]****[Match Architect's sample]****[Anodized color as selected by Architect from full range of industry colors and color densities]****<Insert finish>**.
 - c. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color **[as indicated by**



- manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
- d. Overcoat: [Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>.
6. Background Texture: [Smooth][Pebble][Leatherette][Matte][Stipple][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert description>.
 7. Integrally Cast Border Style: [As indicated on Drawings][Square cut without border][Square single line, polished][Square double line, polished][Plain bevel, brushed][Plain bevel, polished][Projected bevel][Raised flat band][Double-raised line border]<Insert description>.
 8. Applied Frame Material, Style, and Finish: [As indicated on Drawings]<Insert description>.
 9. Mounting: [As indicated on Drawings][Concealed studs][Rosette-head through fasteners][Countersunk flathead through fasteners][Adhesive][Two-face tape]<Insert requirement>.
 10. Text and Typeface: [Accessible raised characters and Braille][Times Roman][Typeface as indicated by manufacturer's designation][Typeface matching Architect's sample][Typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>.[Finish raised characters to contrast with background color, and finish Braille to match background color.]
- B. Etched Plaque : Chemically etched or photochemically engraved metal sheet or plate with texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [Advance Corporation]
 - d. [Erie Landmark Company; a division of Paul W. Zimmerman Foundaries, Inc.]
 - e. [Gemini Signage; Gemini, Inc.]
 - f. [Metallic Arts]
 - g. [Mohawk Sign Systems]
 - h. [Nelson-Harkins Industries]
 - i. [Signs & Decal Corp]
 - j. [Southwell Company (The)]
 - k. [St. Paul Stamp Works, Inc.]
 - l. [Steel Art Company]
 - m. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [Advance Corporation]
 - d. [Erie Landmark Company; a division of Paul W. Zimmerman Foundaries, Inc.]
 - e. [Gemini Signage; Gemini, Inc.]
 - f. [Metallic Arts]
 - g. [Mohawk Sign Systems]
 - h. [Nelson-Harkins Industries]

- i. **[Signs & Decal Corp]**
 - j. **[Southwell Company (The)]**
 - k. **[St. Paul Stamp Works, Inc.]**
 - l. **[Steel Art Company]**
 - m. **<Insert manufacturer's name>**
- 3. Plaque Material: Sheet or plate **[aluminum][brass][bronze][copper][stainless steel][zinc]<Insert material>**.
 - 4. Plaque Thickness: **[0.064 inch (1.63 mm)][0.125 inch (3.18 mm)][0.153 inch (3.89 mm)][0.250 inch (6.35 mm)]<Insert dimension>**.
 - 5. Finishes:
 - a. Integral Metal Finish: **[Mill][Antique oxidized][Mill finish raised surface with dark oxidized background][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>**.
 - b. Integral Aluminum Finish: **[Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>**.
 - c. Integral Stainless Steel Finish: **[No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>**.
 - d. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color **[as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>**.
 - e. Overcoat: **[Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>**.
 - 6. Integral Edge Style: **[As indicated on Drawings][Square cut, polished][Plain bevel, brushed]<Insert description>**.
 - 7. Applied Frame Material, Style, and Finish: **[As indicated on Drawings]<Insert description>**.
 - 8. Mounting: **[As indicated on Drawings][Concealed studs][Rosette-head through fasteners][Countersunk flathead through fasteners][Adhesive][Two-face tape]<Insert requirement>**.
 - 9. Text and Typeface: **[Accessible raised characters and Braille][Times Roman][Typeface as indicated by manufacturer's designation][Typeface matching Architect's sample][Typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>**. **[Finish raised characters to contrast with background color, and finish Braille to match background color.]**

2.3 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Brass Castings: ASTM B584, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C85200 (high-copper yellow brass)]<Insert requirement>**.
- E. Brass Sheet (Yellow Brass): ASTM B36/B36M, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish**



indicated][Alloy UNS No. C26000 (yellow brass)]<Insert requirement>.

- F. Bronze Castings: ASTM B584, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C86500 (No. 1 manganese bronze)]<Insert requirement>.
- G. Bronze Plate: ASTM B36/B36M, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C22000 (commercial bronze)]<Insert requirement>.
- H. Copper Sheet: ASTM B152/B152M.
- I. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304,][Type 316,] stretcher-leveled standard of flatness.
- J. Zinc Castings: ASTM B240, alloy and temper recommended by plaque manufacturer for type of use and finish indicated.
- K. Zinc Sheet: [ASTM B69]<Insert standard>, alloy and temper recommended by plaque manufacturer for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish [nonferrous-metal][stainless steel][or][hot-dip galvanized]<Insert requirement> devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use [flathead][or][oval countersunk]<Insert shape> screws and bolts with tamper-resistant [Allen-head][spanner-head][or][one-way-head]<Insert slot design> slots unless otherwise indicated.
 - 4. Plaque Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching plaque finish, with type of head indicated, installed in predrilled holes.
- B. Adhesive: As recommended by plaque manufacturer.
 - 1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch (1.14 mm)** thick, with adhesive on both sides.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.
1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Surface-Engraved Graphics: Machine-engrave characters and other graphic devices into indicated plaque surface to produce precisely formed copy, incised to uniform depth.
1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
- C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted plaques to suit plaque construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish **[to match plaque-background color][to match Architect's sample]<Insert requirement>** color unless otherwise indicated.
 2. Stainless Steel Brackets: Factory finish brackets **[to match plaque background][to match Architect's sample][with No. 4]<Insert finish>** finish unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [**Class I, 0.018 mm**][**Class II, 0.010 mm**] or thicker.
- B. Color Anodic Finish: AAMA 611, [**Class I, 0.018 mm**][**Class II, 0.010 mm**] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.
 - 4. Reflective, Directional Polish: No. 7.
 - 5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

2.9 LACQUER COATING FOR COPPER-ALLOY FINISHES

- A. Lacquer Coating: Clear, organic, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of acrylic resin, methyl methacrylate copolymer, leveling agent, and corrosion inhibitor benzotriazole.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for

installation tolerances and other conditions affecting performance.

- B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PLAQUES

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 - 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Plaques Used for Room Identification[and Other Accessible Plaques]: Install in locations on walls [as indicated on Drawings][and][according to accessibility standard]<Insert requirement>.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Through Fasteners: Drill holes in substrate using predrilled holes in plaque as template. Countersink holes in plaque if required. Place plaque in position and flush to surface. Install through fasteners and tighten.
 - 3. Brackets: Remove loose debris from substrate surface and install bracket supports in position, so that plaque is correctly located and aligned.
 - 4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of plaque and of suitable quantity to support weight of plaque after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as plaque is applied and to prevent visibility of cured adhesive at plaque edges. Place plaque in position, and push to engage adhesive. Temporarily support plaque in position until adhesive fully sets.
 - 5. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of plaque and of suitable quantity to support weight of plaque without slippage. Keep strips away from edges to prevent visibility at plaque edges. Place plaque in position, and push to engage tape adhesive.
 - 6. Shim-Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach plaques to plate using [method specified above]<Insert requirement>.



3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as plaques are installed.
- C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 16 00

SECTION 10 14 19 00 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.
 - a. Cast dimensional characters.
 - b. Cutout dimensional characters.
 - c. Fabricated channel dimensional characters.
 - d. Illuminated, fabricated channel dimensional characters.
 - e. Molded-plastic dimensional characters.
 - f. Illuminated, molded-plastic dimensional characters.

1.2 ALLOWANCES

- A. Allowances for **[signage][dimensional letter signs][illuminated, fabricated channel dimensional characters]<Insert item description>** are specified in Section 012100 "Allowances."
- B. **<Insert product or material>[is][are]** part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.5 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.
 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.



- C. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least **[half size]<Insert scale>**.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
 - D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
 - E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: **[Full-size Sample][Half-size Sample]<Insert size>** of **[each type of]** dimensional character.
 - 2. Exposed Accessories: **[Full-size Sample][Half-size Sample]<Insert size>** of each accessory type.
 - 3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
 - F. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.
 - G. Delegated Design Submittal: For **[signs indicated in "Performance Requirements" Article]<Insert sign designations>**.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For **[Installer][and][manufacturer]**.
 - B. Sample Warranty: For special warranty.
- 1.8 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For signs to include in maintenance manuals.
- 1.9 QUALITY ASSURANCE
- A. Installer Qualifications: **[Manufacturer of products][An entity that employs installers and supervisors who are trained and approved by manufacturer]**.
- 1.10 FIELD CONDITIONS
- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other

installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of **[rooftop][dimensional character]<Insert description>** sign type(s) **<Insert drawing designation of sign(s)>** according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 - 1. Uniform Wind Load: **[As indicated on Drawings]<Insert design load>**.
 - 2. Concentrated Horizontal Load: **[As indicated on Drawings]<Insert design load>**.
 - 3. Other Design Load: **[As indicated on Drawings]<Insert design load>**
 - 4. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: For exterior **[fabricated channel dimensional characters]<Insert item>**, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>**.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters : Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.R.K. Ramos]**

- b. [ACE Sign Systems, Inc.]
- c. [ASI Sign Systems, Inc]
- d. [Cosco]
- e. [Gemini Signage; Gemini, Inc.]
- f. [Matthews International Corporation; Bronze Division]
- g. [Metal Arts]
- h. [Metallic Arts]
- i. [Southwell Company (The)]
- j. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [A.R.K. Ramos]
- b. [ACE Sign Systems, Inc.]
- c. [ASI Sign Systems, Inc]
- d. [Cosco]
- e. [Gemini Signage; Gemini, Inc.]
- f. [Matthews International Corporation; Bronze Division]
- g. [Metal Arts]
- h. [Metallic Arts]
- i. [Southwell Company (The)]
- j. <Insert manufacturer's name>

- 3. Character Material: Cast [aluminum][brass][bronze][zinc]<Insert material>.
- 4. Character Height: [As indicated on Drawings]<Insert dimension>.
- 5. Thickness: [As indicated on Drawings][Manufacturer's standard for size of character]<Insert dimension>.
- 6. Finishes:

- a. Integral Metal Finish: [Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
- b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
- c. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
- d. Overcoat: [Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>.

- 7. Mounting: [As indicated on Drawings][Concealed studs][Projecting studs][Rosette-head through fasteners][Countersunk flathead through fasteners]<Insert requirement>.
- 8. Typeface: [Times Roman]<Insert requirement>.

- B. Cutout Characters : Characters with uniform faces; square-cut, smooth[, eased] edges; precisely formed lines and profiles; and as follows:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [APCO Graphics, Inc]
 - d. [ASI Sign Systems, Inc]
 - e. [Cosco]
 - f. [Diskey Sign Company]
 - g. [Gemini Signage; Gemini, Inc.]
 - h. [inpro Corporation]
 - i. [Matthews International Corporation; Bronze Division]
 - j. [Metal Arts]
 - k. [Metallic Arts]
 - l. [Southwell Company (The)]
 - m. [Steel Art Company]
 - n. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [APCO Graphics, Inc]
 - d. [ASI Sign Systems, Inc]
 - e. [Cosco]
 - f. [Diskey Sign Company]
 - g. [Gemini Signage; Gemini, Inc.]
 - h. [inpro Corporation]
 - i. [Matthews International Corporation; Bronze Division]
 - j. [Metal Arts]
 - k. [Metallic Arts]
 - l. [Southwell Company (The)]
 - m. [Steel Art Company]
 - n. <Insert manufacturer's name>
3. Character Material: Sheet or plate [aluminum][brass][bronze][copper][stainless steel][zinc][acrylic][acrylic with laminated aluminum facing][acrylic with laminated brass facing][acrylic with laminated bronze facing][acrylic with laminated stainless steel facing]<Insert material>.
4. Character Height: [As indicated on Drawings]<Insert dimension>.
5. Thickness: [As indicated on Drawings][Manufacturer's standard for size of character][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
6. Finishes:
- a. Integral Metal Finish: [Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
 - c. Integral Stainless Steel Finish: [No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>.
 - d. Integral Acrylic Color: [As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.

- f. Overcoat: **[Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>**.
- g. Painted Edges: Paint edges of acrylic characters with laminated metal facing as recommended in writing by manufacturer.
7. Mounting: **[As indicated on Drawings][Concealed studs][Projecting studs][Rosette-head through fasteners][Countersunk flathead through fasteners][Concealed, painted aluminum back bar or bracket assembly][Concealed, stainless steel back bar or bracket assembly][Adhesive]<Insert requirement>**.
8. Typeface: **[Times Roman]<Insert requirement>**.
- C. Fabricated Channel Characters : **[Metal face and side returns][Open face with metal side returns][Translucent face with metal side returns]**, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.R.K. Ramos]**
 - b. **[ACE Sign Systems, Inc.]**
 - c. **[Allen Industries]**
 - d. **[APCO Graphics, Inc]**
 - e. **[ASI Sign Systems, Inc]**
 - f. **[Charleston Manufacturing, LLC]**
 - g. **[Cosco]**
 - h. **[Gemini Signage; Gemini, Inc.]**
 - i. **[Metallic Arts]**
 - j. **[Signs & Decal Corp]**
 - k. **[Steel Art Company]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.R.K. Ramos]**
 - b. **[ACE Sign Systems, Inc.]**
 - c. **[Allen Industries]**
 - d. **[APCO Graphics, Inc]**
 - e. **[ASI Sign Systems, Inc]**
 - f. **[Charleston Manufacturing, LLC]**
 - g. **[Cosco]**
 - h. **[Gemini Signage; Gemini, Inc.]**
 - i. **[Metallic Arts]**
 - j. **[Signs & Decal Corp]**
 - k. **[Steel Art Company]**
 - l. **<Insert manufacturer's name>**
 3. Illuminated Characters: **[Backlighting][Frontlighting]** character construction with **[fluorescent tube][fiber-optic][LED][neon tube]<Insert requirement>** lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing

connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.

- a. Power: **[As indicated on electrical Drawings][120 V, 60 Hz, 1 phase, 15 A]<Insert requirement>**.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior characters. **[Equip weeps with permanent baffles to block light leakage without inhibiting drainage.]**
4. Character Material: Sheet or plate **[aluminum][brass][bronze][copper][steel][stainless steel][zinc]<Insert material>**.
 5. Material Thickness: **[As indicated on Drawings][Manufacturer's standard for size and design of character][0.100 inch (2.54 mm)][0.032 inch (0.81 mm)][Nominal 0.048 inch (1.21 mm) thick for face and 0.030 inch (0.76 mm) thick for returns][0.050 inch (1.27 mm) thick for face and 0.031 inch (0.79 mm) thick for returns]<Insert dimension(s)>**.
 6. Translucent Face Sheet: Acrylic sheet with integral color **[matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>**.
 - a. Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard thickness for size of character][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 7. Character Height: **[As indicated on Drawings]<Insert dimension>**.
 8. Character Depth: **[As indicated on Drawings]<Insert dimension>**.
 9. Finishes:
 - a. Integral Metal Finish: **[Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>**.
 - b. Integral Aluminum Finish: **[Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>**.
 - c. Integral Stainless Steel Finish: **[No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>**.
 - d. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color **[as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>**.
 - e. Overcoat: **[Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>**.
 10. Mounting: **[As indicated on Drawings][Manufacturer's standard for size and design of character][Projecting studs][Concealed, painted aluminum back bar or bracket assembly][Concealed, stainless steel back bar or bracket assembly]<Insert requirement>**.
 - a. Hold characters at **[2-inch (51-mm) distance][manufacturer's recommended distance][distance as selected by Architect]<Insert dimension>** from wall surface.
 11. Typeface: **[Times Roman]<Insert requirement>**.
- D. Molded-Plastic Characters : **[Injection molded][or][thermoformed]** characters having uniform faces and profiles, and as follows:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ACE Sign Systems, Inc.]
 - b. [ASI Sign Systems, Inc]
 - c. [Cosco]
 - d. [Gemini Signage; Gemini, Inc.]
 - e. [Metallic Arts]
 - f. [Signs & Decal Corp]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ACE Sign Systems, Inc.]
 - b. [ASI Sign Systems, Inc]
 - c. [Cosco]
 - d. [Gemini Signage; Gemini, Inc.]
 - e. [Metallic Arts]
 - f. [Signs & Decal Corp]
 - g. <Insert manufacturer's name>
3. Illuminated Characters: Characters with concealed [fluorescent tube][fiber-optic][LED][neon tube] lighting, including transformers, insulators, and other accessories; with provision for servicing and concealing connections to building electrical system. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
 - a. Power: [As indicated on electrical Drawings][120 V, 60 Hz, 1 phase, 15 A]<Insert requirement>.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior characters.[Equip weeps with permanent baffles to block light leakage without inhibiting drainage.]
4. Color: Manufacturer's standard [integral color][painted finish] process, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
5. Typeface: [Times Roman]<Insert requirement>.

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Brass Castings: ASTM B584, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C85200 (high-copper yellow brass)]<Insert requirement>.
- E. Brass Sheet (Yellow Brass): ASTM B36/B36M, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C26000 (yellow brass)]<Insert requirement>.

- F. Bronze Castings: ASTM B584, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C86500 (No. 1 manganese bronze)]<Insert requirement>.
- G. Bronze Plate: ASTM B36/B36M, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C22000 (commercial bronze)]<Insert requirement>.
- H. Copper Sheet: ASTM B152/B152M.
- I. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304,][Type 316,] stretcher-leveled standard of flatness.
- J. Zinc Castings: ASTM B240, alloy and temper recommended by sign manufacturer for type of use and finish indicated.
- K. Zinc Sheet: [ASTM B69]<Insert standard>, alloy and temper recommended by sign manufacturer for type of use and finish indicated.
- L. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- M. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish [nonferrous-metal][stainless steel][or][hot-dip galvanized]<Insert requirement> devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use [flathead][or][oval countersunk]<Insert shape> screws and bolts with tamper-resistant [Allen-head][spanner-head][or][one-way-head]<Insert slot design> slots unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
 - 1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch (1.14 mm)** thick, with adhesive on both sides.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish **[to match sign-background color][to match Architect's sample]<Insert requirement>** color unless otherwise indicated.
 2. Stainless Steel Brackets: Factory finish brackets **[to match sign background][to match Architect's sample][with No. 4]<Insert finish>** finish unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [**Class I, 0.018 mm**][**Class II, 0.010 mm**] or thicker.
- B. Color Anodic Finish: AAMA 611, [**Class I, 0.018 mm**][**Class II, 0.010 mm**] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.
 - 4. Reflective, Directional Polish: No. 7.
 - 5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

2.9 LACQUER COATING FOR COPPER-ALLOY FINISHES

- A. Lacquer Coating: Clear, organic, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of acrylic resin, methyl methacrylate copolymer, leveling agent, and corrosion inhibitor benzotriazole.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 - 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
 - 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign

without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19 00



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Task	Specification	Specification Description
10 14 19 00	01 11 19 00	No Specification Required



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SECTION 10 14 23 00 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.
2. Field-applied, vinyl-character signs.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection-zone signage.
3. Section 101300 "Directories" for building directories.
4. Section 101423.16 "Room-Identification Panel Signage" for room-identification signs that are directly attached to the building.
5. Section 101426 "Post and Panel/Pylon Signage" for freestanding signs.
6. **[Section 142100 "Electric Traction Elevators"]****[Section 142400 "Hydraulic Elevators"]****[Section 143100 "Escalators"]****[Section 143200 "Moving Walks"]****[Section 144200 "Wheelchair Lifts"]** for code-required conveying equipment signage.
7. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
8. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
9. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
10. Section 265213 "Emergency and Exit Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.2 ALLOWANCES

- A. Allowances for **[signage]****[panel signs]**<Insert item description> are specified in Section 012100 "Allowances."
- B. <Insert product or material>**[is]****[are]** part of <Insert name of allowance>.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.
- B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.5 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data:
 - 1. Panel signs.
 - 2. Field-applied, vinyl-character signs.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements[, **including raised characters and Braille**], and layout for each sign at least **[half size]<Insert scale>**.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Panel Signs: **[Full-size Sample][Not less than 12 inches (300 mm) square, including corner]<Insert size>**.
 - 2. Field-Applied, Vinyl-Character Signs: **[Full-size Sample of characters on glass]<Insert requirement>**.
 - 3. Variable Component Materials: **[Full-size Sample][8-inch (200-mm) Sample]<Insert size>** of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 4. Exposed Accessories: **[Full-size Sample][Half-size Sample]<Insert size>** of each accessory type.
 - 5. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- F. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.
- G. Delegated Design Submittals: For **[signs indicated in "Performance Requirements" Article]<Insert sign designations>**.

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer][and][manufacturer]**.
- B. Evaluation Reports: For **[post-installed anchors][and][power-actuated fasteners]**, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
- C. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Variable Component Materials: **[12]<Insert number>** replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
 2. Tools: **[One]<Insert number>** set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: **[Manufacturer of products][An entity that employs installers and supervisors who are trained and approved by manufacturer]**.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify locations of **[anchorage devices][and][electrical service]** embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of [rooftop][illuminated panel]<Insert description> sign type(s) <Insert drawing designation of sign(s)> according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements are to withstand the effects of gravity and other loads within limits and under conditions indicated.
 - 1. Uniform Wind Load: [As indicated on Drawings]<Insert design load>.
 - 2. Concentrated Horizontal Load: [As indicated on Drawings]<Insert dimension>.
 - 3. Other Design Load: [As indicated on Drawings]<Insert dimension>.
 - 4. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: [120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>.
- D. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"]<the ABA standards of the Federal agency having jurisdiction>[and]<ICC A117.1><Insert requirement>.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PANEL SIGNS

- A. Panel Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ACE Sign Systems, Inc.]
 - b. [Advance Corporation]
 - c. [Allen Industries]
 - d. [Allen Markings]
 - e. [APCO Graphics, Inc]
 - f. [ASE, Inc]
 - g. [ASI Sign Systems, Inc]
 - h. [Best Sign Systems, Inc.]
 - i. [Bunting Graphics, Inc]
 - j. [Clarke Systems]
 - k. [Cosco]
 - l. [Diskey Sign Company]
 - m. [Foresight Supersign]

- n. [Fossil Industries, Inc.]
 - o. [inpro Corporation]
 - p. [Mohawk Sign Systems]
 - q. [Nelson-Harkins Industries]
 - r. [Poblocki Sign Company, LLC]
 - s. [Seton Identification Products; a Brady Corporation company]
 - t. [Signs & Decal Corp]
 - u. [Vista System, LLC]
 - v. [Vomar Products, Inc]
 - w. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ACE Sign Systems, Inc.]
 - b. [Advance Corporation]
 - c. [Allen Industries]
 - d. [Allen Markings]
 - e. [APCO Graphics, Inc]
 - f. [ASE, Inc]
 - g. [ASI Sign Systems, Inc]
 - h. [Best Sign Systems, Inc.]
 - i. [Bunting Graphics, Inc]
 - j. [Clarke Systems]
 - k. [Cosco]
 - l. [Diskey Sign Company]
 - m. [Foresight Supersign]
 - n. [Fossil Industries, Inc.]
 - o. [inpro Corporation]
 - p. [Mohawk Sign Systems]
 - q. [Nelson-Harkins Industries]
 - r. [Poblocki Sign Company, LLC]
 - s. [Seton Identification Products; a Brady Corporation company]
 - t. [Signs & Decal Corp]
 - u. [Vista System, LLC]
 - v. [Vomar Products, Inc]
 - w. <Insert manufacturer's name>
3. Illuminated Panel Sign: [Backlighted][Edgelighted] construction with [fluorescent tube][fiber-optic][LED][neon tube]<Insert requirement> lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
- a. Power: [As indicated on electrical Drawings][120 V, 60 Hz, 1 phase, 15 A]<Insert requirement>.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior signs.[Equip weeps with permanent baffles to block light leakage without inhibiting drainage.]
4. Solid-Sheet Sign: [Aluminum][Brass][Bronze][Copper][Steel][Stainless steel][Acrylic][Fiberglass][PVC]<Insert material> sheet [and returns][, returns, and back] with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:
- a. Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.060

- inch (1.52 mm)][0.080 inch (2.03 mm)][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
- b. Surface-Applied, Flat Graphics: Applied [vinyl film][baked enamel or powder coat][paint][photo image]<Insert requirement>.
 - c. Surface-Applied, Raised Graphics: Applied [polymer characters][and][Braille]<Insert requirement>.
 - d. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - e. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics [flush with][slightly projecting from] the sign panel.
5. Laminated Aluminum-Sheet Sign: Aluminum sheet laminated to both sides of [acrylic][phenolic]<Insert material> core sheet[with painted edges].
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
 - b. Surface-Applied, Flat Graphics: Applied [vinyl film][paint][photo image]<Insert requirement>.
 - c. Surface-Applied, Raised Graphics: Applied [polymer characters][and][Braille]<Insert requirement>.
6. Laminated-Sheet Sign: [Photopolymer][Sandblasted polymer]<Insert material> face sheet with raised graphics laminated[over subsurface graphics] to [acrylic][phenolic]<Insert material> backing sheet to produce composite sheet.
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
 - b. Surface-Applied, Flat Graphics: Applied [vinyl film][paint][photo image]<Insert requirement>.
 - c. Surface-Applied, Raised Graphics: Applied [polymer characters][and][Braille]<Insert requirement>.
 - d. Subsurface Graphics: [Reverse halftone or dot-screen image][Reverse etch image][Snap-in changeable insert beneath removable face sheet][Slide-in changeable insert]<Insert requirement>.
7. Composite Phenolic-Core Sign: Solid phenolic panel core with integral subsurface graphic image covered with integral, polymeric face layer.
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.5 inch (12.7 mm)][1 inch (25.4 mm)]<Insert dimension>.
8. Laminated Polycarbonate-Sheet Sign: Polycarbonate face sheet laminated to each side of [phenolic]<Insert material> base sheet to produce composite sheet.
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
 - b. Surface-Applied, Flat Graphics: Applied [vinyl film][paint][photo image]<Insert requirement>.
 - c. Surface-Applied, Raised Graphics: Applied [polymer characters][and][Braille]<Insert requirement>.
 - d. Subsurface Graphics: [Reverse halftone or dot-screen image][Reverse etch image]<Insert requirement>.
9. Engraved Plastic-Laminate Sign: Plastic-laminate face laminated to contrasting phenolic core to produce composite sheet.

- a. Composite-Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 - b. Engraved Graphics: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
 - c. Plastic-Laminate Color and Pattern: **[As indicated by manufacturer's designation][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
 - d. Core Color: Manufacturer's standard **[dark color]<Insert color>**.
10. Sign-Panel Perimeter: Finish edges smooth.
- a. Edge Condition:
 - 1) Vertical Edges: **[As indicated on Drawings][Square cut][Beveled][Bullnosed]<Insert requirement>**.
 - 2) Horizontal Edges: **[As indicated on Drawings][Square cut][Beveled][Bullnosed]<Insert requirement>**.
 - b. Corner Condition in Elevation: **[As indicated on Drawings][Square][Rounded to radius indicated]<Insert requirement>**.
11. Frame: **[Entire perimeter][Horizontal retainers][Vertical retainers][to hold changeable sign panel]<Insert description>**.
- a. Material: **[Aluminum][Brass][Bronze][Steel][Stainless steel][PVC]<Insert material>**.
 - b. Material Thickness: **<Insert dimension>**.
 - c. Frame Depth: **[As indicated on Drawings]<Insert dimension>**.
 - d. Profile: **[Square][Beveled][Rounded]<Insert requirement>**.
 - e. Corner Condition in Elevation: **[Square][Mitered][Rounded to radius indicated]<Insert requirement>**.
 - f. Finish and Color: **[Mill][Painted, matte black color][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
12. Mounting: **[As indicated on Drawings][Manufacturer's standard method for substrates indicated][Surface mounted to wall][Projecting from wall][Suspended][Aluminum bracket][Stainless steel bracket]<Insert requirement> with [concealed anchors][countersunk flathead through fasteners][adhesive][two-face tape][hook-and-loop tape][or][magnetic tape]**.
13. Surface Finish and Applied Graphics:
- a. Integral Metal Finish: **[Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>**.
 - b. Integral Aluminum Finish: **[Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>**.
 - c. Integral Stainless Steel Finish: **[No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>**.
 - d. Integral Sheet Color: **[Acrylic][Fiberglass][PVC] sheet with color [as indicated by manufacturer's designation][to match Architect's sample][as selected by Architect from full range of industry colors]<Insert color>**.
 - e. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color **[as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>**.
 - f. Painted Finish and Graphics: Manufacturer's standard, factory-applied **[exterior-grade sign paint][acrylic polyurethane]<Insert requirement>**, in color **[as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect**



- from manufacturer's full range]<Insert color>.
- g. Photo-Image Graphics: Manufacturer's standard [black-and-white][multicolor], [600-dpi]<Insert value> halftone or dot-screen image.
- h. Overcoat: [Manufacturer's standard baked-on clear coating]<Insert requirement>.
- 14. Text and Typeface: [Accessible raised characters and Braille][Times Roman][typeface as indicated by manufacturer's designation][typeface matching Architect's sample][typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>.[Finish raised characters to contrast with background color, and finish Braille to match background color.]
- 15. Flatness Tolerance: Sign is to remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus [1/16 inch (1.5 mm)]<Insert dimension> measured diagonally from corner to corner.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

- A. Field-Applied, Vinyl-Character Sign : Prespaced characters die cut from [3- to 3.5-mil (0.076- to 0.089-mm)]<Insert dimensions> thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Allen Markings]
 - b. [APCO Graphics, Inc]
 - c. [inpro Corporation]
 - d. [Mohawk Sign Systems]
 - e. [Seton Identification Products; a Brady Corporation company]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Allen Markings]
 - b. [APCO Graphics, Inc]
 - c. [inpro Corporation]
 - d. [Mohawk Sign Systems]
 - e. [Seton Identification Products; a Brady Corporation company]
 - f. <Insert manufacturer's name>
 - 3. Size: [As indicated on Drawings][As scheduled]<Insert requirement>.
 - 4. Substrate: [As indicated on Drawings][As scheduled][Glass][Doors][Walls]<Insert substrate>.
 - 5. Text and Font: [As indicated on Drawings][As scheduled]<Insert requirement>.

2.4 PANEL-SIGN MATERIALS

- A. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Brass Sheet (Yellow Brass): ASTM B36/B36M, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C26000 (yellow brass)]<Insert requirement>**.
- D. Bronze Plate: ASTM B36/B36M, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C22000 (commercial bronze)]<Insert requirement>**.
- E. Copper Sheet: ASTM B152/B152M.
- F. Steel Materials:
 - 1. Metallic-Coated Steel Sheet: ASTM A653/A653M, **[G90 (Z275)]<Insert coating designation>** coating, either commercial or forming steel.
 - 2. Steel Sheet: **[Uncoated, cold-rolled, ASTM A1008/A1008M, commercial steel, Type B, exposed][or][electrolytic zinc-coated, ASTM A879/A879M, Coating Designation 08Z (24G), with steel-sheet substrate according to ASTM A1008/A1008M, commercial steel, exposed]**.
 - 3. Steel Members Fabricated from Plate or Bar Stock: ASTM A529/A529M or ASTM A572/A572M, **42,000-psi (290-MPa)** minimum yield strength.
 - 4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- G. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, **[Type 304,][Type 316,]** stretcher-leveled standard of flatness.
- H. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- I. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- J. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.
- K. PVC Sheet: Manufacturer's standard, UV-light stable, PVC plastic.
- L. Plastic-Laminate Sheet: ISO 4586-3, Grade HGS.
- M. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- N. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:



1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish **[nonferrous-metal][stainless steel][or][hot-dip galvanized]<Insert requirement>** devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use **[flathead][or][oval countersunk]<Insert shape>** screws and bolts with tamper-resistant **[Allen-head][spanner-head][or][one-way-head]<Insert slot design>** slots unless otherwise indicated.
 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
 - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
 5. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on **[ICC-ES AC01][ICC-ES AC193][ICC-ES AC58][or][ICC-ES AC308]** as appropriate for the substrate.
1. Uses: Securing signs with imposed loads to structure.
 2. Type: **[Torque-controlled, expansion anchor][torque-controlled, adhesive anchor][or][adhesive anchor]**.
 3. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or **ASTM F1941 (ASTM F1941M)**, Class Fe/Zn 5, unless otherwise indicated.
 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)][Group 2 (A4)]** stainless steel bolts, **ASTM F593 (ASTM F738M)**, and nuts, **ASTM F594 (ASTM F836M)**.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Adhesive: As recommended by sign manufacturer.
1. Adhesives shall have a VOC content of **[70]<Insert value>** g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical

- Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
 - E. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch (1.14 mm)** thick, with adhesive on both sides.
 - F. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
 - G. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
 - H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into indicated sign surface to produce precisely formed copy, incised to uniform depth.
 1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
 2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
 3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.
 4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image is to be free of rough edges.
- D. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- E. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.



- F. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. **[Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>**.
 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. **[Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>**.
 3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. **[Subsequent changeable sign panels are by Owner]<Insert requirement>**.
- G. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish **[to match sign-background color][to match Architect's sample]<Insert requirement>** color unless otherwise indicated.
 2. Stainless Steel Brackets: Factory finish brackets **[to match sign background][to match Architect's sample][with No. 4]<Insert finish>** finish unless otherwise indicated.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker.
- B. Color Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.9 METALLIC-COATED STEEL FINISHES

- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not

leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.

- B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

2.10 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.
 - 1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.
- B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.
 - 4. Reflective, Directional Polish: No. 7.
 - 5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

- D. Verify that electrical service is correctly sized and located to accommodate signs.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Accessible Signage: Install in locations on walls **[as indicated on Drawings][and][according to the accessibility standard]<Insert requirement>**.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 - 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
 - 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris.

- Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
7. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips **[0.250 inch (6.35 mm)]<Insert dimension>** away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
 8. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
 9. Shim-Plate Mounting: Provide **1/8-inch- (3-mm-)** thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using **<Insert mounting method>** method specified above.
- D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
- E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign and two-face tape.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23 00



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SECTION 10 14 23 00A - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.
- B. Related Requirements:
 - 1. Section 101300 "Directories" for building directories.
 - 2. Section 101416 "Plaques" for one-piece, solid metal signs, with or without frames, that are used for high-end room-identification.

1.2 ALLOWANCES

- A. Allowances for **[signage][room-identification signs]<Insert item description>** are specified in Section 012100 "Allowances."
- B. **<Insert product or material>[is][are]** part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.5 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements[, **including raised characters and Braille**], and layout for each sign at least [**half size**]<Insert scale>.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room-Identification Signs: [**Full-size Sample**]<Insert size>.
 - 2. Variable Component Materials: [**Full-size Sample**][**8-inch (200-mm) Sample**]<Insert size> of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 3. Exposed Accessories: [**Full-size Sample**][**Half-size Sample**]<Insert size> of each accessory type.
 - 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- F. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [**Installer**][**and**][**manufacturer**].
- B. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Variable Component Materials: [**12**]<Insert number> replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
 - 2. Tools: [**One**]<Insert number> set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: [**Manufacturer of products**][**An entity that employs installers and supervisors who are trained and approved by manufacturer**].

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify locations of **[anchorage devices][and][electrical service]** embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and][ICC A117.1]<Insert requirement>**.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign : **[Sign][Sign system]** with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ACE Sign Systems, Inc.]**
 - b. **[Advance Corporation]**
 - c. **[Allen Industries]**
 - d. **[APCO Graphics, Inc]**
 - e. **[ASE, Inc]**
 - f. **[ASI Sign Systems, Inc]**
 - g. **[Best Sign Systems, Inc.]**
 - h. **[Clarke Systems]**
 - i. **[Cosco]**
 - j. **[Diskey Sign Company]**
 - k. **[Foresight Supersign]**
 - l. **[inpro Corporation]**
 - m. **[Mohawk Sign Systems]**
 - n. **[Nelson-Harkins Industries]**

- o. [Poblocki Sign Company, LLC]
 - p. [Seton Identification Products; a Brady Corporation company]
 - q. [Signature Signs, Inc.]
 - r. [Signs & Decal Corp]
 - s. [Vista System, LLC]
 - t. [Vomar Products, Inc]
 - u. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ACE Sign Systems, Inc.]
 - b. [Advance Corporation]
 - c. [Allen Industries]
 - d. [APCO Graphics, Inc]
 - e. [ASE, Inc]
 - f. [ASI Sign Systems, Inc]
 - g. [Best Sign Systems, Inc.]
 - h. [Clarke Systems]
 - i. [Cosco]
 - j. [Diskey Sign Company]
 - k. [Foresight Supersign]
 - l. [inpro Corporation]
 - m. [Mohawk Sign Systems]
 - n. [Nelson-Harkins Industries]
 - o. [Poblocki Sign Company, LLC]
 - p. [Seton Identification Products; a Brady Corporation company]
 - q. [Signature Signs, Inc.]
 - r. [Signs & Decal Corp]
 - s. [Vista System, LLC]
 - t. [Vomar Products, Inc]
 - u. <Insert manufacturer's name>
3. Laminated-Sheet Sign: [Photopolymer][Sandblasted polymer]<Insert material> face sheet with raised graphics laminated[over subsurface graphics] to [acrylic][phenolic]<Insert material> backing sheet to produce composite sheet.
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>.
 - b. Surface-Applied Graphics: Applied [vinyl film][paint][photo image]<Insert requirement>.
 - c. Subsurface Graphics: [Reverse halftone or dot-screen image][Reverse etch image][Snap-in changeable insert beneath removable face sheet][Slide-in changeable insert]<Insert requirement>.
 - d. Color(s): [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
4. Sign-Panel Perimeter: Finish edges smooth.
- a. Edge Condition[at Vertical Edges][at Horizontal Edges]: [As indicated on Drawings][Square cut][Beveled][Bullnosed]<Insert requirement>.
 - b. Corner Condition in Elevation: [As indicated on Drawings][Square][Rounded to radius indicated]<Insert requirement>.
5. Frame: [Entire perimeter][Horizontal retainers][Vertical retainers][to hold changeable sign

panel]<Insert description>.

- a. Material: **[Aluminum]<Insert material>**.
 - b. Material Thickness: **<Insert dimension>**.
 - c. Frame Depth: **[As indicated on Drawings][Convex-curved frame to receive removable face sheet and changeable subsurface graphics]<Insert dimension>**.
 - d. Profile: **[Square][Beveled][Rounded]<Insert requirement>**.
 - e. Corner Condition in Elevation: **[Square][Mitered][Rounded to radius indicated]<Insert requirement>**.
 - f. Finish and Color: **[Mill][Clear anodized][Light bronze anodized][Medium bronze anodized][Painted, matte black color][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
6. Mounting: **[Manufacturer's standard method for substrates indicated][Surface mounted to wall] with [concealed anchors][countersunk flathead through fasteners][adhesive][two-face tape][hook-and-loop tape][or][magnetic tape]**.
 7. Text and Typeface: **[Accessible raised characters and Braille][Times Roman][typeface as indicated by manufacturer's designation][typeface matching Architect's sample][typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>**. **[Finish raised characters to contrast with background color, and finish Braille to match background color.]**

2.3 SIGN MATERIALS

- A. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings **[and suitable for exterior applications]**.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish **[nonferrous-metal][stainless-steel][or][hot-dip galvanized]<Insert requirement>** devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - b. Fastener Heads: Use **[flathead][or][oval countersunk]<Insert shape>** screws and bolts with tamper-resistant **[Allen-head][spanner-head][or][one-way-head]<Insert slot design>** slots unless otherwise indicated.

4. Sign Mounting Fasteners:

- a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
- b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

1. Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.**D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.****E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.****2.5 FABRICATION****A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.**

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. **[Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>**.
 - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. **[Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>**.
 - 3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. **[Subsequent changeable sign panels are by Owner]<Insert requirement>**.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker.
- B. Color Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls **[as indicated on Drawings][and][according to the**

accessibility standard]<Insert requirement>.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips [0.250 inch (6.35 mm)]<Insert dimension> away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
6. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23 00A

SECTION 10 14 23 00B - POST AND PANEL_PYLON SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonilluminated post-and-panel signs.
2. Internally illuminated post-and-panel signs.
3. Nonilluminated pylon signs.
4. Internally illuminated pylon signs.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.
2. Section 033000 "Cast-in-Place Concrete" for concrete foundations, concrete fill in postholes, and setting anchor bolts in concrete foundations for signs.
3. Section 101416 "Plaques" for one-piece, solid-metal signs, with or without frames.
4. Section 101423 "Panel Signage" and Section 101423.16 "Room-Identification Panel Signage" for wall-mounted sign panels.

1.2 ALLOWANCES

- A. Allowances for **[signage][post-and-panel signs][and][pylon signs]<Insert item description>** are specified in Section 012100 "Allowances."
- B. **<Insert product or material>[is][are]** part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.5 COORDINATION

- A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.



1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signage.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least **[half size]<Insert scale>**.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly, showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Post-and-Panel Signs: **[Full-size Sample][Not less than 12 inches (300 mm) square, including corner and post]<Insert size>**.
 - 2. Pylon Signs: **[Full-size Sample][Not less than 12 inches (300 mm) square, including corner]<Insert size>**.
 - 3. Variable Component Materials: **[Full-size Sample][8-inch (200-mm) Sample]<Insert size>** of each base material, character or graphic element, in each exposed color and finish not included in other Samples.
 - 4. Exposed Accessories: **[Full-size Sample][Half-size Sample]<Insert size>** of each accessory type.
 - 5. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For post-and-panel and pylon signs. Use same designations indicated on Drawings or specified.
- F. Delegated-Design Submittal: For **[signs indicated in "Performance Requirements" Article]<Insert sign designations>**.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer][and][manufacturer]**.
- B. Evaluation Reports: For **[post-installed anchors][and][power-actuated fasteners]**, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
- C. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Variable Component Materials: **[12]<Insert number>** replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
 2. Tools: **[One]<Insert number>** set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: **[Manufacturer of products][An entity that employs installers and supervisors who are trained and approved by manufacturer].**

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify locations of **[anchorage devices][and][electrical service]** embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of **[post-and-panel][pylon]<Insert description>** sign type(s) **<Insert drawing designation of sign(s)>** according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

1. Uniform Wind Load: **[As indicated on Drawings]<Insert design load>**.
2. Concentrated Horizontal Load: **[As indicated on Drawings]<Insert design load>**.
3. Other Design Load: **[As indicated on Drawings]<Insert design load>**.
4. Uniform and concentrated loads need not be assumed to act concurrently.

C. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>**.

D. Accessibility Standard: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and]****[ICC A117.1]<Insert requirement>**.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 POST-AND-PANEL SIGNS

A. Post-and-Panel Sign : Sign of **[single-panel]****[hollow-box]<Insert description>** configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ACE Sign Systems, Inc.]**
 - b. **[Allen Industries]**
 - c. **[APCO Graphics, Inc]**
 - d. **[ASI Sign Systems, Inc]**
 - e. **[Bunting Graphics, Inc]**
 - f. **[Charleston Manufacturing, LLC]**
 - g. **[Clarke Systems]**
 - h. **[Diskey Sign Company]**
 - i. **[Foresight Supersign]**
 - j. **[Fossil Industries, Inc.]**
 - k. **[Nelson-Harkins Industries]**
 - l. **[Poblocki Sign Company, LLC]**
 - m. **[Signs & Decal Corp]**
 - n. **[Vista System, LLC]**
 - o. **[Vomar Products, Inc]**
 - p. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ACE Sign Systems, Inc.]**
 - b. **[Allen Industries]**
 - c. **[APCO Graphics, Inc]**
 - d. **[ASI Sign Systems, Inc]**

- e. **[Bunting Graphics, Inc]**
 - f. **[Charleston Manufacturing, LLC]**
 - g. **[Clarke Systems]**
 - h. **[Diskey Sign Company]**
 - i. **[Foresight Supersign]**
 - j. **[Fossil Industries, Inc.]**
 - k. **[Nelson-Harkins Industries]**
 - l. **[Poblocki Sign Company, LLC]**
 - m. **[Signs & Decal Corp]**
 - n. **[Vista System, LLC]**
 - o. **[Vomar Products, Inc]**
 - p. **<Insert manufacturer's name>**
3. Illuminated Sign: **[Backlighting][Edgelighting]** construction with **[fluorescent tube][fiber-optic][LED][neon tube]<Insert requirement>** lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
- a. Power: **[As indicated on electrical Drawings][120 V, 60 Hz, 1 phase, 15 A]<Insert requirement>**.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior signs. **[Equip weeps with permanent baffles to block light leakage without inhibiting drainage.]**
4. Solid-Sheet Sign Panels **[and Returns][, Returns, and Back]:**
[Aluminum][Brass][Bronze][Copper][Stainless-steel][Acrylic][Fiberglass][Polycarbonate]<Insert material> sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph and as follows:
- a. Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.060 inch (1.52 mm)][0.080 inch (2.03 mm)][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 - b. Surface-Applied Graphics: Applied **[vinyl film][baked enamel or powder coat][paint][photo image]<Insert requirement>**.
 - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - d. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics **[flush with][slightly projecting from]** the sign panel.
5. Laminated, Aluminum-Sheet Sign Panels: Aluminum sheet laminated to both sides of **[acrylic][phenolic]<Insert material>** core sheet **[with painted edges]**.
- a. Composite-Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 - b. Surface-Applied Graphics: Applied **[vinyl film][paint][photo image]<Insert requirement>**.
6. Composite, Phenolic-Core Sign Panels: Solid phenolic panel core with integral subsurface graphic image covered with integral, polymeric face layer.
- a. Composite-Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
7. Single-Panel Sign Frame: **[Entire perimeter][Horizontal retainers][Vertical retainers]<Insert description>**.
- a. Material: **[Aluminum][Brass][Bronze][Steel][Stainless steel]<Insert material>**.

- b. Material Thickness: <Insert dimension>.
 - c. Frame Depth: [As indicated on Drawings]<Insert dimension>.
 - d. Profile: [Square][Beveled][Rounded]<Insert requirement>.
 - e. Corner Condition in Elevation: [Square][Mitered][Rounded to radius indicated]<Insert requirement>.
 - f. Finish and Color: [Mill][Black baked enamel or powder coat][Match sign-panel face][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
8. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded-aluminum, hollow-box-type frame with vertical edges attached to supports with aluminum fittings. Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.
 - a. Hollow-Box Depth: [2 inches (50 mm)][6 inches (150 mm)][Same depth as posts]<Insert requirement>.
 - b. Profile: [Square][Beveled][Rounded]<Insert requirement>.
 - c. Corner Condition in Elevation: [Square][Mitered][Rounded to radius indicated]<Insert requirement>.
 - d. Finish and Color: [Mill][Black baked enamel or powder coat][Match sign-panel face][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
9. Sign-Frame Mounting: [Between posts][Over posts][As indicated on Drawings]<Insert description>.
10. Multiple-Message Bars and Inserts: Fixed message bars capable of receiving changeable messages in the form of slide-in, [aluminum][acrylic-sheet]<Insert material> changeable inserts. [Provide initial messages as indicated on Drawings.]
11. Posts: [Aluminum][Steel]<Insert material>.
 - a. Shape: [Round][Square][Rectangular][Semicircular].
 - b. Size: [2-inch (50-mm) diameter][3-inch (75-mm) diameter][4-inch (100-mm) diameter][2 by 2 inches (50 by 50 mm)][3 by 3 inches (75 by 75 mm)][4 by 4 inches (100 by 100 mm)][2 by 4 inches (50 by 100 mm)][1-3/4 by 3 inches (44 by 75 mm)]<Insert dimension(s)>.
 - c. Installation Method: [Direct burial][Baseplate][Sleeve][Reverse sleeve]<Insert requirement>.
 - d. Finish and Color: [Mill][Black baked enamel or powder coat][Match sign-panel face][Match sign-panel frame][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
12. Sign-Panel-Face Finish and Applied Graphics:
 - a. Integral Metal Finish: [Mill][Antique oxidized][Mill finish raised surface with dark oxidized background][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
 - c. Integral Stainless-Steel Finish: [No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>.
 - d. Integral [Acrylic][Fiberglass][Polycarbonate] Sheet Color: [As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color [as indicated by manufacturer's designation][match Architect's sample][as selected by

- ## 2.3 PYLON SIGNS

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ACE Sign Systems, Inc.]
 - b. [Allen Industries]
 - c. [APCO Graphics, Inc]
 - d. [ASI Sign Systems, Inc]
 - e. [Bunting Graphics, Inc]
 - f. [Charleston Manufacturing, LLC]
 - g. [Diskey Sign Company]
 - h. [Foresight Supersign]
 - i. [Nelson-Harkins Industries]
 - j. [Poblocki Sign Company, LLC]
 - k. [Signs & Decal Corp]
 - l. [Vista System, LLC]
 - m. [Vomar Products, Inc]
 - n. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ACE Sign Systems, Inc.]
 - b. [Allen Industries]
 - c. [APCO Graphics, Inc]
 - d. [ASI Sign Systems, Inc]
 - e. [Bunting Graphics, Inc]
 - f. [Charleston Manufacturing, LLC]
 - g. [Diskey Sign Company]
 - h. [Foresight Supersign]
 - i. [Nelson-Harkins Industries]
 - j. [Poblocki Sign Company, LLC]
 - k. [Signs & Decal Corp]
 - l. [Vista System, LLC]
 - m. [Vomar Products, Inc]

- n. <Insert manufacturer's name>
3. Illuminated Sign: **[Backlighted][Edgelighted]** construction with **[fluorescent tube][fiber-optic][LED][neon tube]<Insert requirement>** lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
 - a. Power: **[As indicated on electrical Drawings][120 V, 60 Hz, 1 phase, 15 A]<Insert requirement>**.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior signs.
 4. Solid-Sheet Sign Panels **[and Returns][, Returns, and Back]:**
[Aluminum][Brass][Bronze][Copper][Stainless-steel][Acrylic][Fiberglass][Polycarbonate]<Insert material> sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.060 inch (1.52 mm)][0.080 inch (2.03 mm)][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 - b. Surface-Applied Graphics: Applied **[vinyl film][baked enamel or powder coat][paint][photo image]<Insert requirement>**.
 - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - d. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics **[flush with][slightly projecting from]** the sign panel.
 5. Laminated, Aluminum-Sheet Sign Panels: Aluminum sheet laminated to both sides of **[acrylic][phenolic]<Insert material>** core sheet **[with painted edges]**.
 - a. Composite-Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 - b. Surface-Applied Graphics: Applied **[vinyl film][paint][photo image]<Insert requirement>**.
 6. Composite, Phenolic-Core Sign Panels: Solid phenolic panel core with integral subsurface graphic image covered with integral, polymeric face layer.
 - a. Composite-Sheet Thickness: **[As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
 7. Single-Panel Sign Frame: **[Entire perimeter][Horizontal retainers][Vertical retainers]<Insert description>**.
 - a. Material: **[Aluminum][Brass][Bronze][Steel][Stainless steel]<Insert material>**.
 - b. Material Thickness: **<Insert dimension>**.
 - c. Frame Depth: **[As indicated on Drawings]<Insert dimension>**.
 - d. Profile: **[Square][Beveled][Rounded]<Insert requirement>**.
 - e. Corner Condition in Elevation: **[Square][Mitered][Rounded to radius indicated]<Insert requirement>**.
 - f. Finish and Color: **[Mill][Black baked enamel or powder coat][Match sign-panel face][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 8. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded-aluminum, hollow-box-type frame with vertical edges attached to supports with aluminum fittings.

Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.

- a. Hollow-Box Depth: [2 inches (50 mm)][6 inches (150 mm)][Same depth as external pylon frame]<Insert requirement>.
 - b. Profile: [Square][Beveled][Rounded]<Insert requirement>.
 - c. Corner Condition in Elevation: [Square][Mitered][Rounded to radius indicated]<Insert requirement>.
 - d. Finish and Color: [Mill][Black baked enamel or powder coat][Match sign-panel face][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
9. Sign-Frame Mounting: [Between pylon supports][Over pylon supports][As indicated on Drawings]<Insert description>.
 10. Multiple-Message Bars and Inserts: Fixed message bars capable of receiving changeable messages in the form of slide-in, [aluminum][acrylic-sheet]<Insert material> changeable inserts.[Provide initial messages as indicated on Drawings.]
 11. Pylon Structure: [Internal][External] frame.
 - a. Pylon Shape: [Rectangular][Square][Triangular][Circular]<Insert requirement>.
 - b. External-Frame Finish and Color: [Mill][Black baked enamel or powder coat][Match sign-panel face][Match sign-panel frame][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
 12. Sign-Panel-Face Finish and Applied Graphics:
 - a. Integral Metal Finish: [Mill][Antique oxidized][Mill finish raised surface with dark oxidized background][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
 - c. Integral Stainless-Steel Finish: [No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>.
 - d. Integral [Acrylic][Fiberglass][Polycarbonate] Sheet Color: [As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color [as indicated by manufacturer's designation][match Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
 - f. Painted Finish and Graphics: Manufacturer's standard, factory-applied [exterior-grade sign paint][acrylic polyurethane]<Insert requirement>, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
 - g. Photo-Image Graphics: Manufacturer's standard [black-and-white][multicolor], [600-dpi]<Insert value> halftone or dot-screen image.
 - h. Overcoat: [Manufacturer's standard baked-on clear coating]<Insert requirement>.
 13. Text and Typeface: [Times Roman][typeface as indicated by manufacturer's designation][typeface matching Architect's sample][typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>.

2.4 MATERIALS

- A. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Brass Sheet (Yellow Brass): ASTM B36/B36M, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C26000 (yellow brass)]<Insert requirement>**.
- D. Bronze Plate: ASTM B36/B36M, **[alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C22000 (commercial bronze)]<Insert requirement>**.
- E. Copper Sheet: ASTM B152/B152M.
- F. Steel Materials:
 - 1. Metallic-Coated Steel Sheet: ASTM A653/A653M, **[G90 (Z275)]<Insert coating designation>** coating, either commercial or forming steel.
 - 2. Steel Sheet: **[Uncoated, cold-rolled, ASTM A1008/A1008M, commercial steel, Type B, exposed][or][electrolytic zinc-coated, ASTM A879/A879M, Coating Designation 08Z (24G), with steel sheet substrate according to ASTM A1008/A1008M, commercial steel, exposed]**.
 - 3. Hot-Rolled, Structural-Steel Shapes: ASTM A36/A36M or ASTM A529/A529M.
 - 4. Steel Members Fabricated from Plate or Bar Stock: ASTM A529/A529M or ASTM A572/A572M, **42,000-psi (290-MPa)** minimum yield strength.
 - 5. Steel Tubing or Pipe: ASTM A500/A500M, Grade B.
 - 6. Bolts for Steel Framing: ASTM A307 or ASTM F3125/F3125M, **Grade A325 (Grade A325M)** as necessary for design loads and connection details.
 - 7. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- G. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, **[Type 304,][Type 316,]** stretcher-leveled standard of flatness.
- H. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- I. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- J. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.
- K. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- L. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless

otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish **[nonferrous-metal][stainless-steel][or][hot-dip galvanized]<Insert requirement>** devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use **[flathead][or][oval countersunk]<Insert shape>** screws and bolts with tamper-resistant, **[Allen-head][spanner-head][or][one-way-head]<Insert slot design>** slots unless otherwise indicated.
 4. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on **[ICC-ES AC01][ICC-ES AC193][ICC-ES AC58][or][ICC-ES AC308]** as appropriate for the substrate.
1. Uses: Securing signs with imposed loads to structure.
 2. Type: **[Torque-controlled, expansion anchor][torque-controlled, adhesive anchor][or][adhesive anchor]**.
 3. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or **ASTM F1941 (ASTM F1941M)**, Class Fe/Zn 5, unless otherwise indicated.
 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)][Group 2 (A4)]** stainless-steel bolts, **ASTM F593 (ASTM F738M)**, and nuts, **ASTM F594 (ASTM F836M)**.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Anchoring Materials:
1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.

2. Mill joints to tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
- B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus **1/16 inch (1.5 mm)** measured diagonally from corner to corner.
1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
 2. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
 3. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.
- C. Post Fabrication: Fabricate posts designed for structural performance indicated and of lengths required for installation method indicated for each sign.
1. Aluminum Posts: Manufacturer's standard **0.125-inch- (3.18-mm-)** thick, extruded-aluminum tubing unless otherwise indicated, with brackets or slots to engage sign panels. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
 2. Steel Posts: Fabricate from minimum **[0.120-inch- (3.05-mm-)]<Insert dimension>** thick, steel tubing unless otherwise indicated. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
 - a. Hot-dip galvanize post assemblies after fabrication according to ASTM A123/A123M.
 3. Direct Burial: Fabricate posts **36 inches (910 mm)** longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.
 4. Baseplates: Fabricate posts with baseplates welded to bottom of posts. Drill holes in baseplate for anchor-bolt connection.
 - a. Provide **[preset][drilled-in-place]** anchor bolts of size required for connecting posts to concrete foundations.
 5. Sleeves: Fabricate posts **[12 inches (300 mm)]<Insert dimension>** longer than height of sign to permit embedment in sleeves cast in concrete foundations or concrete-filled postholes. Provide sleeves by manufacturer, sized to receive outside diameter of posts. Size sleeves for direct embedment in concrete foundations or concrete-filled postholes and to prevent sign movement, but not less than **[24 inches (610 mm)][36 inches (910 mm)]<Insert dimension>** for embedment.
 6. Reverse Sleeves: Provide inserts by sign manufacturer, sized for close fit inside posts. Size inserts for direct embedment in concrete foundations and to attach sign posts securely and prevent sign movement, but of a height not less than one-third of post height plus **36 inches (910 mm)** for embedment.
 - a. Provide through bolts to fasten posts to inserts.

- D. Pylon Fabrication: Fabricate pylon signs with integral base consisting of channels, angles, plates, or other fittings. Design and fabricate pylon and anchorage for structural performance indicated. Detail anchorage so that water can drain out of assembly without obstruction. Drill holes in members for anchor-bolt connection. Provide anchor bolts of size required for connecting base to concrete foundations.
 - 1. Internal Frames: Manufacturer's standard internal steel framing system and anchorage, modified as required for Project requirements. Provide welded construction. Cut, drill, and tap units to receive hardware, bolts, and similar items.
 - a. Hot-dip galvanize steel framing system after fabrication according to ASTM A123/A123M.
 - 2. External Frames: Manufacturer's standard external [aluminum][steel] framing system and anchorage for direct attachment of sign message panels, modified as required for Project requirements. Provide welded construction using mitered joints. Cut, drill, and tap units to receive hardware, bolts, and similar items.
 - a. Hot-dip galvanize steel framing system after fabrication according to ASTM A123/A123M.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.
- B. Color Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.9 METALLIC-COATED STEEL FINISHES

- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the

organic coating to be applied over it.

- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

2.10 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.
 - 1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.
- B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.
 - 4. Reflective, Directional Polish: No. 7.
 - 5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Verify that electrical service is correctly sized and located to accommodate signs.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING POSTS

- A. Vertical Tolerance: Set posts plumb within a tolerance of **[1/16 inch in 3 feet (2 mm in 1 m)]<Insert dimensions>**.
- B. Direct-Burial Method:
1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional **[12 inches (300 mm)]<Insert dimension>**, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
 2. Setting in Earth: Set post in position, support to prevent movement, and backfill with satisfactory soil or well-graded aggregate as recommended in writing by manufacturer. Place and compact backfill in **6-inch (150-mm)** lifts, compacting each lift.
 3. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete **[in posthole][or][for concrete foundation]** as indicated on Drawings.
 4. Setting in Preformed Hole in Concrete Foundation: Form or core drill holes in concrete foundation not less than **3/4 inch (20 mm)** larger than outside dimension of post for installing posts in concrete. Set post in position, shim to prevent movement, and fill annular space between post and hole with **[nonshrink, nonmetallic grout][or][anchoring cement]**, mixed and placed to comply with manufacturer's written instructions.
 - a. Cover anchorage joint in concrete foundations with flange of same metal and finish as post, **[welded to post after placing anchoring material][attached to post with set screws]**.
 - b. Leave anchorage joint exposed with **[1/8-inch (3-mm) anchoring material sloped away from post][anchoring material flush with adjacent surface]**.
- C. Baseplate Method:
1. Preset Anchor Bolts: Set post baseplate in position over anchor bolts projecting from concrete foundation, shim and support post to prevent movement, place washers and nuts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
 2. Drilled-in-Place Anchor Bolts: Set post baseplate in position over concrete foundation, locate and drill anchor holes, shim and support post to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
- D. Sleeve Method: Set post in position in sleeve and support post to prevent movement, fill annular space between post and sleeve with **[nonshrink, nonmetallic grout][or][anchoring cement]**, mixed and

placed to comply with manufacturer's written instructions.

1. Cover anchorage joint with flange of same metal and finish as post, **[welded to post after placing anchoring material][attached to post with set screws]**.
2. Leave anchorage joint exposed with **[1/8-inch (3-mm) anchoring material sloped away from post][anchoring material flush with adjacent surface]**.

- E. Reverse-Sleeve Method: Set post in position over the projecting insert and support post to prevent movement, drill posts and inserts for through bolts, and install and tighten through bolts.

3.4 INSTALLING PYLONS

- A. Vertical Tolerance: Install pylons plumb within a tolerance of **[1/16 inch in 3 feet (2 mm in 1 m)]<Insert dimensions>**.
- B. Attachment with Preset Anchor Bolts: Set pylon base in position over anchor bolts projecting from concrete foundation, shim and support pylon to prevent movement, place washers and nuts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
- C. Attachment with Drilled-in-Place Anchor Bolts: Set pylon base in position over concrete foundation, locate and drill anchor holes, shim and support pylon to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23 00B

SECTION 10 14 23 00C - MODULAR SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular signs.

B. Related Requirements:

1. Section 101300 "Directories" for building directories enclosed in cases or illuminated.
2. Section 101423 "Panel Signage" for one-piece signs.
3. Section 101423.16 "Room-Identification Signage" for panel-type room-identification signs.
4. Section 101426 "Post and Panel/Pylon Signage" for freestanding signs.

1.2 ALLOWANCES

- A. Allowances for **[signage][modular signs]<Insert item description>** are specified in Section 012100 "Allowances."

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1. Unit prices apply to authorized work covered by **[quantity allowances][estimated quantities]**.
2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 ACTION SUBMITTALS

- A. Product Data: Modular signs.

- B. Product Data Submittals:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

- D. Shop Drawings: For modular signs.

1. Include plans, elevations, sections, and mounting details.
2. Show message list, typestyles, graphic elements, **including raised characters and Braille**, and layout for each sign at least **[half size]<Insert scale>**.



- E. Samples for Initial Selection: For each type of modular sign, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- F. Samples for Verification: For each type of modular sign showing each component and with the required finishes, in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Modular Signs: **[Full-size Sample][Not less than 12 inches (300 mm) square, including corner]<Insert size>**; including one of each type insert indicated.
- G. Product Schedule: For modular signs. Use same designations indicated on Drawings or specified.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Inserts: Full-size blank inserts equal to **[10]<Insert number>** percent of number installed for each size indicated, but no fewer than **[20]<Insert number>**.
 - 2. Tools: One set of specialty tools for replacing inserts.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and]****[ICC A117.1]<Insert requirement>**.

2.2 MODULAR SIGNS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[2/90 Sign Systems]**
 - 2. **[APCO Graphics, Inc]**
 - 3. **[Appenx, Inc.]**
 - 4. **[ASI Sign Systems, Inc]**
 - 5. **[Best Sign Systems, Inc.]**
 - 6. **[Clarke Systems]**
 - 7. **[inpro Corporation]**
 - 8. **[Vista System, LLC]**
 - 9. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[2/90 Sign Systems]**
 2. **[APCO Graphics, Inc]**
 3. **[Appenx, Inc.]**
 4. **[ASI Sign Systems, Inc]**
 5. **[Best Sign Systems, Inc.]**
 6. **[Clarke Systems]**
 7. **[inpro Corporation]**
 8. **[Vista System, LLC]**
 9. **<Insert manufacturer's name>**
- C. Sign System: Sign with removable inserts for graphics and copy attached to a receiver frame system using clips, splines, or comparable method. Provide system with modular increments of height and width, permitting assembly of units with multiple inserts of varying size.
1. Sign Size: **[As indicated]<Insert dimensions>**.
 2. Provide tamper-resistant feature requiring special tool to change inserts.
 3. Backer Panel: Shaped, decorative backing panel mounted behind modular signage system **[as indicated][as selected from manufacturer's full range]**.
 4. Double-Faced Signs: Provide signs with two faces back-to-back for signs suspended from ceiling or mounted perpendicular to wall, and as indicated.
- D. Inserts:
1. Module Height: System of inserts fabricated in multiples of **[manufacturer's standard dimension][9/16 inch (15 mm)][1 inch (25 mm)][1.25 inches (32 mm)]<Insert dimension>**.
 2. Type: **[Extruded aluminum for applied graphics][Rigid plastic for applied graphics][Extruded aluminum with slots for secondary inserts]**.
 - a. Secondary Inserts: **[Transparent plastic lens to cover paper inserts][ADA compliant with raised text and Braille][Opaque plastic with surface graphics]**.
 3. Finish: **[Anodized][Painted][Plastic laminate]**.
 4. Color and Pattern: **[One][Two]<Insert quantity> color(s), [indicated by manufacturer's designation][selected by Architect from manufacturer's full range]<Insert color and pattern>**.
- E. Graphics and Copy:
1. Surface Applied: **[Die-cut vinyl film][Silk-screen][Direct print][Paint][Photo image]<Insert requirement>**.
 2. Raised, ADA Compliant: **[Manufacturer's standard][Applied][Photopolymer][Subsurface] raised characters and Braille <Insert requirement>**.
 3. Etched and Filled: Sign face etched or routed to receive enamel-paint infill.
 4. Engraved: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
 5. Text and Typeface: **[Times Roman][Arial][Typeface as indicated by manufacturer's designation][Typeface matching Architect's sample][Typeface as selected by Architect from manufacturer's full range]<Insert typeface or requirement>.[Finish raised characters to contrast with background color, and finish Braille to match background color.]**
- F. End Caps and Trim:
1. Side Trim: Continuous **[extruded-aluminum]<Insert material>** trim attached to message-strip



- receiver frame.
2. End Caps: **[Individual snap-on caps for each message strip][Snap-on caps covering ends of multiple message strips]**.
3. Profile: **[Narrow][Square][Bevel][Radius corner][Quarter round][Stepped][Contoured]<Insert shape>**.
4. Top and Bottom Trim: **[Message strips with integral trim profile to provide finished appearance][Extruded-aluminum trim section, attached to message-strip receiver frame]**. Provide **[narrow face][square][bevel][contoured]** profile.

G. Mounting: Mount modular signs to wall surfaces using **[manufacturer's standard method][adhesive][two-faced tape][magnetic tape][hook-and-loop tape][or][screws]**.

1. Suspended Mounting: Provide hanger and bracket designed to support signs from **[suspended ceiling grid][building structure]**. Factory finish to match **[sign-background color][Architect's sample color]<Insert requirement>** unless otherwise indicated.
2. Perpendicular Wall Mount: Provide bracket designed to support signs perpendicular to wall surface, and to suit mounting conditions. Attach with screws or other method capable of supporting weight of sign. Factory finish to match **[sign-background color][Architect's sample color]<Insert requirement>** unless otherwise indicated.

H. Accessories: Provide **[sliding insert to indicate room occupancy][user-changeable paper insert feature][note gripper][pen holder]<Insert accessory>** where indicated.

2.3 MATERIALS

- A. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Plastic-Laminate Sheet: ISO 4586-3, Grade HGS.
- C. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form copy indicated on Drawings.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined. Use concealed fasteners and anchors unless indicated to be exposed.
- B. Adhesive: As recommended by sign manufacturer.
 1. Adhesives shall have a VOC content of **[70]<Insert value>** g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Adhesive shall comply with the testing and product requirements of the California Department of

Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch (1.14 mm)** thick, with adhesive on both sides.
- D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
- E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 FABRICATION

- A. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into indicated sign surface to produce precisely formed copy, incised to uniform depth.
- B. Subsurface-Applied Graphics: Apply graphics to back of clear face-sheet material to produce precisely formed image. Image to be free of rough edges.
- C. Subsurface-Engraved Graphics: Reverse engrave back of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for

installation tolerances and other conditions affecting performance of the Work.

- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install signs using mounting methods indicated and in accordance with manufacturer's written instructions.
- B. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
- C. Accessible Signage: Install in locations on walls **[as indicated on Drawings][and][in accordance with the accessibility standards]<Insert requirement>**.
- D. Clean substrate of **[adhesives][and][tapes]** to remove materials that would adversely affect bond. Use materials and quantities sufficient to support weight of sign after cure without slippage. Keep **[adhesives][and][tapes]** away from edges to prevent visibility at sign edges.

3.3 ADJUSTING AND CLEANING

- A. Touch up factory-applied finishes to restore damaged or soiled areas.
- B. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 10 14 23 00C

SECTION 10 14 23 00D - PAINTED SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-lettered signs painted directly on substrates in good condition.
2. Wall-identification signs for fire and smoke assemblies.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Section 099423 "Gilding" for gilding surfaces and gilding applied to painted signs.
3. Section 101423 "Panel Signage" for field-applied, vinyl-character signs.
4. Section 321723 "Pavement Markings" for signage painted on pavements.

1.2 ALLOWANCES

- A. Allowances for **[signage][painted signs]<Insert item description>** are specified in Section 012100 "Allowances."
- B. **<Insert product or material>[is][are]** part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.
- B. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- C. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- E. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- F. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- G. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

10 - Specialties

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For painted signs.
 - 1. Show sign locations and mounting heights.
 - 2. Show message list, typestyles, graphic elements, and layout for each sign at least **[half size]<Insert scale>**.
- D. Samples: For each type of paint, paint system, color, and gloss; **[minimum 4 inches (100 mm) long in least dimension]<Insert dimensions>**; on hardboard.
 - 1. Include stepped Samples defining each separate coat, if any. Resubmit until each required sheen, color, and texture is achieved.
 - 2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
 - 3. Include a list of materials for each coat of each Sample.
 - 4. Label each Sample for location and application.
- E. Product Schedule: For painted signs. Use same designations indicated on Drawings or specified.

1.7 INFORMATIONAL SUBMITTALS

- A. Color Matching Certificate: For computer color matching of colors.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and sign location on building.
 - 1. Quantity: Furnish Owner with an additional **[3][5][7]<Insert number>** percent, but not less than **[1 gal. (3.8 L)]<Insert quantity>** of each material and color applied.

1.9 QUALITY ASSURANCE

- A. Color Matching: Custom computer-match paint colors to colors indicated **[in sign schedule at the end of Part 3][on Drawings]<Insert requirement>**. **[For colors indicated by a standardized coding system, obtain a color chip for each color indicated from the color-coding-system company;**

computer-match paint colors to the color chips.]

- B. Mockups: Prepare mockups of painted signs for each type of sign material and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
1. Locate mockups **[on existing surfaces where directed by Architect][in locations that enable viewing under same conditions as the completed Work]<Insert requirement>.**
 2. Sign Mockups: **[Two]<Insert number>** sign texts that represent surfaces and conditions for signage application under same conditions as the completed Work.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with painting signs only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to have painted signs are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

PART 2 - PRODUCTS

2.1 SIGN PAINT

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[Matthews Paint; A Subsidiary of PPG]**
 2. **[Ronan Paints; Coventry Coatings Company]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Matthews Paint; A Subsidiary of PPG]**
 2. **[Ronan Paints; Coventry Coatings Company]**
 3. **<Insert manufacturer's name>**

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.

2.3 PAINTED SIGNS

- A. Painted Sign : Sign painted directly on indicated substrate, including primers, sealers, undercoats, and transition coats as required.
 - 1. Paint Type: [Alkyd][Epoxy][Latex][Polyurethane] <Insert requirement>.
 - a. Gloss: [Level 1][Level 2][Level 3][Level 4][Level 5][Level 6].
 - 2. Substrate: [As indicated on Drawings][As scheduled][Painted surface][Concrete][Stone][Glazed block][Glass][Wood] <Insert item>.
 - 3. Text and Typeface: [Arial][Times Roman][As indicated on Drawings][As scheduled][Match Architect's sample][Match design reference sample] <Insert requirement>.
 - a. Size: [As indicated on Drawings][As scheduled][2 in. (51 mm) based on height of uppercase "I" letter] <Insert requirement>.
 - b. Color: [As indicated on Drawings][As scheduled][Black] <Insert color>.
 - 4. Background: [Characters outlined][Overall rectangular background] <Insert requirement>.
 - a. Thickness or Extent: [As indicated on Drawings][As scheduled] <Insert requirement>.
 - b. Color: [As indicated on Drawings][As scheduled][Light gray] <Insert requirement>.
- B. Wall-Identification Sign : Sign applied directly on indicated substrate to identify fire and smoke assemblies, including preparatory treatment as required.
 - 1. Sign Material: Stenciled-on [alkyd][latex][or][VOC-compliant spray-applied] <Insert paint type> paint or preprinted, self-adhesive decals <Insert requirement>.
 - 2. Font: Minimum [3 inches (76 mm)] <Insert dimension> high characters in a contrasting color, with minimum [0.375-inch (9.5-mm)] <Insert dimension> wide strokes.
 - 3. Text: ["FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS."]["1-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."]["2-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."]["SMOKE BARRIER - PROTECT ALL OPENINGS."] <Insert text.>

2.4 PAINT MATERIALS

- A. Sign Paints and Coatings: Inks, dyes, and paints that are recommended in writing by manufacturer for optimum adherence to substrate and are UV and water resistant for colors and exposure indicated.
 - 1. Compatibility: Provide paint materials that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.
- B. VOC Content. LEED 2009: For field applications that are inside the weatherproofing system, paints and

coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Clear Wood Finishes, Varnishes: 350 g/L.
 9. Clear Wood Finishes, Lacquers: 550 g/L.
 10. Floor Coatings: 100 g/L.
 11. Shellacs, Clear: 730 g/L.
 12. Shellacs, Pigmented: 550 g/L.
 13. Stains: 250 g/L.
- C. Low-Emitting Materials, LEED 2009: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. VOC Content, LEED v4: For field applications[**that are inside the weatherproofing system**], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 50 g/L.
 3. Dry-Fog Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 100 g/L.
 5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Clear Wood Finishes, Varnishes: 275 g/L.
 9. Clear Wood Finishes, Lacquers: 275 g/L.
 10. Floor Coatings: 50 g/L.
 11. Shellacs, Clear: 730 g/L.
 12. Shellacs, Pigmented: 550 g/L.
 13. Stains: 100 g/L.
- E. Low-Emitting Materials, LEED v4: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Material Emissions and Pollutant Control: Not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.

- c. Nonflat - High-Gloss Coatings: 150 g/L.
 - d. Concrete/Masonry Sealers: 100 g/L.
 - e. Dry-Fog Coatings: 150 g/L.
 - f. Floor Coatings: 100 g/L.
 - g. Industrial Maintenance Coatings: 250 g/L.
 - h. Low-Solids Coatings: 120 g/L.
 - i. Mastic Texture Coatings: 100 g/L.
 - j. Metallic Pigmented Coatings: 500 g/L.
 - k. Pretreatment Wash Primers: 420 g/L.
 - l. Primers, Sealers, and Undercoaters: 100 g/L.
 - m. Reactive Penetrating Sealers: 350 g/L.
 - n. Recycled Coatings: 250 g/L.
 - o. Rust-Preventive Coatings: 250 g/L.
- G. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
- 1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoats: 100 g/L.
 - d. Floor Coatings: 100 g/L.
 - e. Shellacs, Clear: 730 g/L.
 - f. Shellacs, Pigmented: 550 g/L.
 - g. Stains: 250 g/L.
 - h. Clear Wood Finishes (Varnishes, Sanding Sealers, and Lacquers): 275 g/L.
- H. VOC Content: For field applications inside the building, wall paints shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
- 1. Interior Flat Latex Wall Paint: 50 g/L.
 - 2. Interior Nonflat Latex Wall Paint: 150 g/L.
- I. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance. Comply with paint manufacturer's written instructions for inspection.
- B. If existing surfaces cannot be prepared to an acceptable condition for proper painting, notify Architect in writing.

- C. Proceed with installation only after unsatisfactory conditions have been corrected and surface is dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

- A. Appearance Standard: Completed sign work shall have a sharp and uniformly delineated appearance as viewed by Architect from building interior at [5 feet (1.5 m)][10 feet (3 m)]<Insert distance> away from painted surface and from building exterior at [20 feet (6 m)][50 feet (15 m)]<Insert distance> away from painted surface.
- B. Comply with manufacturers' written instructions for surface preparation and paint-application for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings and substrate materials.
- D. Apply primers, sealers, undercoats, and transition coats so that they do not extend beyond the limits of the painted signage. Remove excess without damaging the substrate.
- E. Install signs level, plumb, true to line, with uniform delineation and borders, and at locations and heights indicated.
 - 1. Prespaced characters with template, cutout stencil, or ruler and straightedge.
- F. Accessible Signage: Install in locations on walls [as indicated on Drawings][and][according to accessibility standard]<Insert requirement>.
- G. Signs Painted on Glass: Provide opaque[, black]<Insert color> paint matching painted sign material and finish onto opposite side of glass to conceal back of sign.

3.3 MARKING FIRE AND SMOKE ASSEMBLIES

- A. Wall-Identification Signs: Permanently identify both sides of each fire and smoke assembly indicated on Drawings. Place signs in accessible, concealed floor, floor-ceiling, or attic space at maximum [15 feet (4.57 m)]<Insert dimension> from end of wall and at maximum intervals of [30 feet (9.14 m)]<Insert dimension>, measured horizontally along the assembly. Locate signs for greatest visibility in the space.

3.4 ADJUSTING AND CLEANING

- A. Remove and reapply damaged or deformed signs and signs that do not comply with specified requirements. Reapply signs with damaged or deteriorated finishes that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. After completing sign application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Remove temporary protective coverings and strippable films as signs are installed.



10 - Specialties

END OF SECTION 10 14 23 00D



Task	Specification	Specification Description
10 14 23 11	10 14 23 00b	Post And Panel_Pylon Signage
10 21 00 00	10 21 23 00	Cubicle Curtains and Track
10 21 13 00	01 11 19 00	No Specification Required
10 21 13 00	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 13 - METAL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach **[ceiling-hung compartments][floor-and-ceiling-anchored compartments][and][post-to-ceiling screens]** to overhead structural system.
2. Section 061000 "Rough Carpentry" for **[blocking][overhead support of floor-and-ceiling-anchored compartments][and][overhead support of post-to-ceiling screens]**.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall **[and ceiling]** to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Metal toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.
6. Show **[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
7. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.



- D. Samples for Verification: Actual sample of finished product for each type of toilet compartment, hardware, and accessory.
 - 1. Size: **[Manufacturers' standard size]**<Insert size>.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.
- G. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declaration (EPD): For each product.
 - 4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 5. Environmental Product Declaration: For each product.
 - 6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
 - 7. Environmental Product Declaration: For each product.
 - 8. Environmental Product Declaration: For each product.
 - 9. Third-Party Certifications: For each product.
 - 10. Third-Party Certified Life Cycle Assessment: For each product.
 - 11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: **[One]**<Insert number> hinge(s) with associated fasteners.
 - 2. Latch and Keeper: **[One]**<Insert number> latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: **[One]**<Insert number> door bumper(s) with associated fasteners.
 - 4. Door Pull: **[One]**<Insert number> door pull(s) with associated fasteners.
 - 5. Fasteners: **[10]**<Insert number> fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain metal toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- B. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- E. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- F. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: [25][75][200] or less.
 - 2. Smoke-Developed Index: 450 or less.
- I. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.

- J. Regulatory Requirements: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]****<Insert accessibility regulation>** for toilet compartments designated as accessible.

2.3 METAL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bradley Corporation]**
6. **[Flush Metal Partitions]**
7. **[General Partitions Mfg. Corp]**
8. **[Hadrian Inc.; Zurn Industries, LLC]**
9. **[Metpar Corp]**
10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bradley Corporation]**
6. **[Flush Metal Partitions]**
7. **[General Partitions Mfg. Corp]**
8. **[Hadrian Inc.; Zurn Industries, LLC]**
9. **[Metpar Corp]**
10. **<Insert manufacturer's name>**

- C. Toilet-Enclosure Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**, **privacy type**.

- D. Entrance-Screen Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**.

- E. Urinal-Screen Style: **[Wall hung, flat panel][Wall hung with integral flanges][Wall hung, wedge shaped][Floor anchored][Overhead braced][Post to ceiling]**.

- F. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. **[Provide with no-sightline system consisting of a full-height continuous stop on latch side of door and full-height continuous filler strip on hinge side of door (unless continuous hinge is used).]** Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of **1 inch (25 mm)** for doors and panels

- and **1-1/4 inches (32 mm)** for pilasters.
 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand specified structural performance requirements.
 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- G. Entrance Screen Construction: Matching panel construction.
- H. Urinal-Screen Construction:
1. Flat-Panel Urinal Screen: Matching panel construction.
 2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum **1-1/4 inches (32 mm)** thick.
 3. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum **6 inches (152 mm)** wide at wall and minimum **1 inch (25 mm)** wide at protruding end.
- I. Facing Sheets and Closures: **[Electrolytically coated steel][or][hot-dip galvanized-steel]** sheet with nominal base-metal (uncoated) thicknesses as follows:
1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than **0.036 inch (0.91 mm)**.
 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than **0.048 inch (1.21 mm)**.
 3. Panels: **[Manufacturer's standard thickness, but not less than 0.030 inch (0.76 mm)][0.036 inch (0.91 mm)]**.
 4. Doors: Manufacturer's standard thickness, but not less than **0.030 inch (0.76 mm)**.
 5. Entrance Screens: Thickness matching panels.
 6. Flat-Panel Urinal Screens: Thickness matching panels.
 7. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.030 inch (0.76 mm)**.
 8. Wedge-Shaped, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.036 inch (0.91 mm)**.
- J. Pilaster Shoes: Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- K. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- L. Urinal-Screen Post: Manufacturer's standard post design of **[material matching the thickness and construction of pilasters][or][1-3/4-inch- (44-mm-) square, aluminum tube with satin finish]**<Insert requirement>; with shoe **[and sleeve (cap)]** matching that on the pilaster.
- M. Brackets (Fittings):
1. Stirrup Type: Ear or U-brackets; **[chrome-plated zamac][stainless steel]**.
 2. Full-Height (Continuous) Type: Manufacturer's standard design; **[stainless steel][aluminum]**.
- N. Steel Sheet Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on finish, including thermosetting, electrostatically applied, and powder coatings. Apply **[one color][two colors]** in each room.
1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]**<Insert color>.

2.4 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.

1. Hinges:

- a. Manufacturer's gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.

- 1) Material, Gravity-Type Hinge: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

- b. Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.

- 1) Material, Continuous, Cam-Type Hinge: Stainless steel.

- c. Manufacturer's continuous, spring-loaded type, allowing emergency access by lifting door.

- 1) Material, Continuous, Spring-Loaded Hinge: **[Stainless steel][Aluminum][Manufacturer's standard]**.

- d. Manufacturer's standard hinge.

- e. **<Insert requirement>**.

- 2. Latch and Keeper: Manufacturer's **[recessed][recessed, with occupancy indicator][surface-mounted]** latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.

- a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

- 3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

- a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

- 4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.

- a. Material: Manufacturer's standard.

- 5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

- a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

B. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

- 1. Hinges: Manufacturer's minimum **0.062-inch- (1.59-mm-)** thick, stainless steel **[gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees][continuous, cam type that swings to a closed or partially open position][continuous, spring-loaded type]<Insert requirement>**, allowing emergency access by lifting door. Mount with through bolts.

2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
 3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.
 5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
1. Electrolytically Zinc Coated: ASTM A879/A879M, **01Z (03G)**.
 2. Hot-Dip Galvanized: ASTM A653/A653M, either hot-dip galvanized or galvanized.
- D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- E. Stainless Steel Castings: ASTM A743/A743M.
- F. Zamac: ASTM B86, commercial zinc-alloy die castings, chrome plated.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories, and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.



- D. Ceiling-Hung Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment at **tops and** bottoms of posts. Provide shoes **and sleeves (caps)** at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide, inswinging doors for standard toilet enclosures and **36-inch- (914-mm-)** wide, outswinging doors with a minimum **32-inch- (813-mm-)** wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: **1/2 inch (13 mm)**.
 - b. Panels or Screens and Walls: **1 inch (25 mm)**.
 - 2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than **[two brackets attached][three brackets attached at midpoint and]** near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.

- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than **2 inches (51 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13 13



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Task	Specification	Specification Description
10 21 13 13	01 11 19 00	No Specification Required
10 21 13 13	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 14 - STAINLESS STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach **[ceiling-hung compartments][floor-and-ceiling-anchored compartments][and][post-to-ceiling screens]** to overhead structural system.
2. Section 061000 "Rough Carpentry" for **[blocking][overhead support of floor-and-ceiling-anchored compartments][and][overhead support of post-to-ceiling screens]**.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall **[and ceiling]** to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Stainless steel toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.
6. Show **[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
7. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available finishes for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.



- D. Samples for Verification: Actual sample of finished products for each type of toilet compartment, hardware, and accessory.
 - 1. Size: **[Manufacturers' standard size]**<Insert size>.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.
- G. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declaration (EPD): For each product.
 - 4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 5. Environmental Product Declaration: For each product.
 - 6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
 - 7. Environmental Product Declaration: For each product.
 - 8. Environmental Product Declaration: For each product.
 - 9. Third-Party Certifications: For each product.
 - 10. Third-Party Certified Life Cycle Assessment: For each product.
 - 11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: **[One]**<Insert number> hinge(s) with associated fasteners.
 - 2. Latch and Keeper: **[One]**<Insert number> latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: **[One]**<Insert number> door bumper(s) with associated fasteners.
 - 4. Door Pull: **[One]**<Insert number> door pull(s) with associated fasteners.
 - 5. Fasteners: **[10]**<Insert number> fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain stainless steel toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- B. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25][50]<Insert value>** percent.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- E. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- F. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25][75][200]** or less.
 - 2. Smoke-Developed Index: 450 or less.
- I. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.

- J. Regulatory Requirements: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]****<Insert accessibility regulation>** for toilet compartments designated as accessible.

2.3 STAINLESS STEEL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bradley Corporation]**
6. **[Flush Metal Partitions]**
7. **[General Partitions Mfg. Corp]**
8. **[Hadrian Inc.; Zurn Industries, LLC]**
9. **[Metpar Corp]**
10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bradley Corporation]**
6. **[Flush Metal Partitions]**
7. **[General Partitions Mfg. Corp]**
8. **[Hadrian Inc.; Zurn Industries, LLC]**
9. **[Metpar Corp]**
10. **<Insert manufacturer's name>**

- C. Toilet-Enclosure Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**, **privacy type**.

- D. Entrance-Screen Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**.

- E. Urinal-Screen Style: **[Wall hung flat panel][Wall hung with integral flanges][Wall hung, wedge shaped][Floor anchored][Overhead braced][Post to ceiling]**.

- F. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. **[Provide with no-sightline system consisting of a full-height continuous stop on latch side of door and full-height continuous filler strip on hinge side of door (unless continuous hinge is used).]** Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of **1 inch (25 mm)** for doors and panels

- and 1-1/4 inches (32 mm) for pilasters.
 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand specified structural performance requirements.
 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- G. Entrance-Screen Construction: Matching panel construction.
- H. Urinal-Screen Construction:
1. Flat-Panel Urinal Screen: Matching panel construction.
 2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches (32 mm) thick.
 3. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum 6 inches (152 mm) wide at wall and minimum 1 inch (25 mm) wide at protruding end.
- I. Facing Sheets and Closures: Stainless steel sheet of nominal thicknesses as follows:
1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch (0.95 mm).
 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.050 inch (1.27 mm).
 3. Panels: [Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm)][0.038 inch (0.95 mm)].
 4. Doors: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
 5. Entrance Screens: Thickness matching panels.
 6. Flat-Panel Urinal Screens: Thickness matching panels.
 7. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm).
 8. Wedge-Shaped, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.038 inch (0.95 mm).
- J. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.
- K. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.
- L. Urinal-Screen Post: Manufacturer's standard post design of [material matching the thickness and construction of pilasters][or][1-3/4-inch- (44-mm-) square, aluminum tube with satin finish]<Insert requirement>; with shoe[and sleeve (cap)] matching that on the pilaster.
- M. Brackets (Fittings):
1. Stirrup Type: Ear or U-brackets; [chrome-plated zamac][stainless steel].
 2. Full-Height (Continuous) Type: Manufacturer's standard design; [stainless steel][aluminum].
- N. Stainless Steel Finish: [Directional Satin Finish: ASTM A480/A480M, No. 4][Manufacturer's standard textured finish]<Insert finish> on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 HARDWARE AND ACCESSORIES**A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.****1. Hinges:**

- a. Manufacturer's gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.

1) Material, Gravity-Type Hinge: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

- b. Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.

1) Material, Continuous, Cam-Type Hinge: Stainless steel.

- c. Manufacturer's continuous, spring-loaded type, allowing emergency access by lifting door.

1) Material, Continuous, Spring-Loaded Hinge: **[Stainless steel][Aluminum][Manufacturer's standard]**.

- d. Manufacturer's standard hinge.

e. **<Insert requirement>**.

2. Latch and Keeper: Manufacturer's **[recessed][recessed, with occupancy indicator][surface-mounted]** latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.

a. Material: Manufacturer's standard.

5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

B. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

1. Hinges: Manufacturer's minimum **0.062-inch- (1.59-mm-)** thick, stainless steel **[gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees][continuous, cam type that swings to a closed or partially open position][continuous, spring-loaded type]<Insert requirement>**, allowing emergency access by lifting door. Mount with through bolts.

2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
 3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.
 5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.
- E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.



- E. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at[**tops and**] bottoms of posts. Provide shoes[**and sleeves (caps)**] at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide inswinging doors for standard toilet enclosures and **36-inch- (914-mm-)** wide outswinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: **1/2 inch (13 mm)**.
 - b. Panels or Screens and Walls: **1 inch (25 mm)**.
 - 2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than [**two brackets attached**][**three brackets attached at midpoint and**] near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than **2 inches (51 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13 14



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Task	Specification	Specification Description
10 21 13 14	01 11 19 00	No Specification Required
10 21 13 14	10 21 13 13	Metal Toilet Compartments
10 21 13 14	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 16 - PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach **[ceiling-hung compartments][floor-and-ceiling-anchored compartments][and][post-to-ceiling screens]** to overhead structural system.
2. Section 061000 "Rough Carpentry" for **[blocking][overhead support of floor-and-ceiling-anchored compartments][and][overhead support of post-to-ceiling screens]**.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall**[and ceiling]** to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show**[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
6. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

- D. Samples for Verification: Actual sample of finished products for each type of toilet compartment,

hardware, and accessory.

1. Size: **[Manufacturers' standard size]**<Insert size>.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

G. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.
12. Product Data: For adhesives, indicating VOC content.
13. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
14. Product Data: For particleboard, indicating that product contains no urea formaldehyde.
15. Laboratory Test Reports: For particleboard, indicating compliance with requirements for low-emitting materials.
16. Laboratory Test Reports: For particleboard, indicating compliance with requirements for low-emitting materials.
17. Product Data: For particleboard, indicating compliance with requirements for formaldehyde emissions.
18. Product Data: For particleboard, indicating that product contains no urea formaldehyde.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Door Hinges: **[One]<Insert number>** hinge(s) with associated fasteners.
 2. Latch and Keeper: **[One]<Insert number>** latch(es) and keeper(s) with associated fasteners.
 3. Door Bumper: **[One]<Insert number>** door bumper(s) with associated fasteners.
 4. Door Pull: **[One]<Insert number>** door pull(s) with associated fasteners.
 5. Fasteners: **[10]<Insert number>** fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain plastic-laminate-clad toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: **[25][75][200]** or less.
2. Smoke-Developed Index: 450 or less.

H. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.

I. Regulatory Requirements: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]****<Insert accessibility regulation>** for toilet compartments designated as accessible.

2.3 PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bobrick Washroom Equipment, Inc]**
6. **[Decolam]**
7. **[Flush Metal Partitions]**
8. **[General Partitions Mfg. Corp]**
9. **[Metpar Corp]**
10. **[Weis/Robart Partitions, Inc.]**
11. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[All American Metal Corp]**
2. **[American Sanitary Partition Corporation]**
3. **[ASI Accurate Partitions]**
4. **[ASI Global Partitions]**
5. **[Bobrick Washroom Equipment, Inc]**
6. **[Decolam]**
7. **[Flush Metal Partitions]**
8. **[General Partitions Mfg. Corp]**
9. **[Metpar Corp]**
10. **[Weis/Robart Partitions, Inc.]**
11. **<Insert manufacturer's name>**

C. Toilet-Enclosure Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored][, privacy type]**.

D. Entrance-Screen Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**.

E. Urinal-Screen Style: **[Wall hung][Floor anchored][Overhead braced][Post to ceiling]**.

- F. Door, Panel, and Pilaster Construction: One-piece, plastic-laminate facing sheets pressure laminated to core material without splices or joints in facings or cores; with **[manufacturer's standard edge trim][laminate]<Insert type>** applied to edges before faces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture. **[Provide with no-sightline system consisting of a full-height continuous stop on latch side of door and full-height continuous filler strip on hinge side of door (unless continuous hinge is used).]**
1. Core Material:
 - a. Door and Panel: **[Particleboard]<Insert type>**.
 - b. Pilaster: **[Manufacturer's standard][particleboard]<Insert type>**.
 2. Thickness:
 - a. Doors and Panels: Finished to not less than **1 inch (25 mm)** thick.
 - b. Pilasters: Finished to not less than **1-1/4 inches (32 mm)** thick **[and with internal, nominal 0.134-inch- (3.42-mm-) thick, steel sheet reinforcement].**
- G. Entrance-Screen Construction: Matching panel construction.
- H. Urinal-Screen Construction: Matching panel construction.
- I. Pilaster Shoes: Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- J. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- K. Urinal-Screen Post: Manufacturer's standard post design of **[material matching the thickness and construction of pilasters][or][1-3/4-inch- (44-mm-) square, aluminum tube with satin finish]<Insert requirement>**; with shoe **[and sleeve (cap)]** matching that on the pilaster.
- L. Brackets (Fittings):
 1. Stirrup Type: Ear or U-brackets, **[chrome-plated zamac][stainless steel]**.
 2. Full-Height (Continuous) Type: Manufacturer's standard design; **[stainless steel][aluminum]**.
- M. Plastic-Laminate Finish: **[One color][Two colors]** in each room.
 1. Color: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. **[Mount with through bolts.]**
1. Hinges:
 - a. Manufacturer's gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
 - 1) Material, Gravity-Type Hinge: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

- b. Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
 - 1) Material, Continuous, Cam-Type Hinge: Stainless steel.
- c. Manufacturer's continuous, spring-loaded type, allowing emergency access by lifting door.
 - 1) Material, Continuous, Spring-Loaded-Type Hinge: Stainless steel.
- d. Manufacturer's standard hinge.
- e. <Insert requirement>.
- 2. Latch and Keeper: Manufacturer's **[recessed][recessed, with occupancy indicator][surface-mounted]** latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
 - a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.
- 3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 - a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.
- 4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.
 - a. Material: Manufacturer's standard.
- 5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.
 - a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.5 MATERIALS

- A. Particleboard: ANSI A208.1, Grade M-2.
 - 1. Particleboard shall be made without urea formaldehyde.
 - 2. Particleboard shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Particleboard shall be made without urea formaldehyde.
 - 4. Particleboard shall have formaldehyde emission rates not greater than 0.09 ppm when tested according to ASTM D 6007 or ASTM E 1333.
 - 5. Particleboard shall be made without urea formaldehyde.

- B. Plastic Laminate: ISO 4586-3, general-purpose HGS grade.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Adhesives: Do not use adhesives that contain urea formaldehyde.
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.
- H. Aluminum Castings: ASTM B26/B26M.
- I. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- J. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- K. Stainless Steel Castings: ASTM A743/A743M.
- L. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at **tops and** bottoms of posts. Provide shoes **and sleeves (caps)** at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide inswinging doors



for standard toilet enclosures and **36-inch- (914-mm-)** wide outswinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: **1/2 inch (13 mm)**.
 - b. Panels or Screens and Walls: **1 inch (25 mm)**.
 - 2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than **[two brackets attached][three brackets attached at midpoint and]** near top and bottom of panel or screen.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than **2 inches (51 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13 16



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Task	Specification	Specification Description
10 21 13 16	01 11 19 00	No Specification Required
10 21 13 16	10 21 13 13	Metal Toilet Compartments
10 21 13 16	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach **[ceiling-hung compartments][floor-and-ceiling-anchored compartments][and][post-to-ceiling screens]** to overhead structural system.
2. Section 061000 "Rough Carpentry" for **[blocking][overhead support of floor-and-ceiling-anchored compartments][and][overhead support of post-to-ceiling screens]**.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall **[and ceiling]** to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show **[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
6. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

- D. Samples for Verification: Actual sample of finished products for each type of toilet compartment,

hardware, and accessory.

1. Size: **[Manufacturer's standard size]<Insert size>**.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

G. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: **[One]<Insert number>** hinge(s) with associated fasteners.
2. Latch and Keeper: **[One]<Insert number>** latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: **[One]<Insert number>** bumper(s) with associated fasteners.
4. Door Pull: **[One]<Insert number>** door pull(s) with associated fasteners.
5. Fasteners: **[10]<Insert number>** fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain plastic toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- H. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.
- I. Regulatory Requirements: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[and]****[ICC A117.1]****<Insert accessibility regulation>** for toilet compartments designated as accessible.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[All American Metal Corp]**
 2. **[American Sanitary Partition Corporation]**
 3. **[ASI Accurate Partitions]**
 4. **[ASI Global Partitions]**
 5. **[General Partitions Mfg. Corp]**
 6. **[Hadrian Inc.; Zurn Industries, LLC]**
 7. **[Knickerbocker Partition Corporation]**
 8. **[Metpar Corp]**
 9. **[Partition Systems International of South Carolina (PSISC); Columbia Systems International of South Carolina LLC]**
 10. **[Scranton Products]**
 11. **[Weis/Robart Partitions, Inc.]**
 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[All American Metal Corp]**
 2. **[American Sanitary Partition Corporation]**
 3. **[ASI Accurate Partitions]**
 4. **[ASI Global Partitions]**
 5. **[General Partitions Mfg. Corp]**
 6. **[Hadrian Inc.; Zurn Industries, LLC]**
 7. **[Knickerbocker Partition Corporation]**
 8. **[Metpar Corp]**
 9. **[Partition Systems International of South Carolina (PSISC); Columbia Systems International of South Carolina LLC]**
 10. **[Scranton Products]**
 11. **[Weis/Robart Partitions, Inc.]**
 12. **<Insert manufacturer's name>**
- C. Toilet-Enclosure Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored][, privacy type]**.
- D. Entrance-Screen Style: **[Overhead braced][Floor anchored][Ceiling hung][Floor-and-ceiling anchored]**.
- E. Urinal-Screen Style: **[Wall hung][Floor anchored][Overhead braced][Post to ceiling]**.
- F. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) material, not less than **1 inch (25 mm)** thick, seamless, with eased edges, and with homogenous color throughout thickness of material. **[Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door (unless continuous hinge is used).]**
1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's continuous, **[extruded-aluminum][or][stainless steel]** strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color: **[One color][Two colors]** in each room **[as indicated by manufacturer's**

designations][as selected by Architect from manufacturer's full range]<Insert color>.

- G. Entrance-Screen Construction: Matching panel construction.
- H. Urinal-Screen Construction: Matching panel construction.
- I. Pilaster Shoes: Manufacturer's standard design; **[solid plastic][or][stainless steel]**.
 - 1. Plastic Color: **[Matching pilaster][Contrasting with pilaster, as indicated by manufacturer's designations][Contrasting with pilaster, as selected by Architect from manufacturer's full range]<Insert color>.**
- J. Pilaster Sleeves (Caps): Manufacturer's standard design; **[solid plastic][or][stainless steel]**.
 - 1. Plastic Color: **[Matching pilaster][Contrasting with pilaster, as indicated by manufacturer's designations][Contrasting with pilaster, as selected by Architect from manufacturer's full range]<Insert color>.**
- K. Urinal-Screen Post: Manufacturer's standard post design of **[material matching the thickness and construction of pilasters][or][1-3/4-inch- (44-mm-) square aluminum tube with satin finish]<Insert requirement>**; with shoe **[and sleeve (cap)]** matching that on the pilaster.
- L. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets, **[aluminum][stainless steel]**.
 - 2. Full-Height (Continuous) Type: Manufacturer's standard design; **[solid plastic or extruded aluminum][solid plastic][extruded aluminum][stainless steel]**.
 - a. Plastic Color: **[Matching panel][Contrasting with panel, as indicated by manufacturer's designations][Contrasting with panel, as selected by Architect from manufacturer's full range]<Insert color>.**
- M. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid plastic.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. **[Mount with through bolts.]**
 - 1. Hinges:
 - a. Manufacturer's paired, wraparound, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
 - 1) Material, Paired Hinge: Aluminum.
 - b. Manufacturer's **[continuous, cam type that swings to a closed or partially open position][continuous, spring-loaded type]**, allowing emergency access by lifting door.
 - 1) Material, Continuous Hinge: **[Aluminum][Stainless steel][Manufacturer's standard]**.
 - c. Manufacturer's integral hinge for solid-plastic doors, allowing emergency access by lifting

door.

1) Material, Integral Hinge: Nylon gravity cam unit with stainless steel pins/screws.

d. Manufacturer's standard hinge.

e. <Insert requirement>.

2. Latch and Keeper: Manufacturer's surface-mounted latch unit, designed for emergency access, and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.

a. Material: **[Aluminum][Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

a. Material: **[Chrome-plated zamac][Stainless steel][Manufacturer's standard]**.

B. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

1. Hinges: Manufacturer's minimum **0.062-inch- (1.59-mm-)** thick, stainless steel **[paired, wraparound, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees][continuous, cam type that swings to a closed or partially open position][continuous, spring-loaded type]**<Insert requirement>, allowing emergency access by lifting door. Mount with through bolts.

2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.

3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.

4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.

5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.

C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt

applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.
- E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at[**tops and**] bottoms of posts. Provide shoes[**and sleeves (caps)**] at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide, inswinging doors for standard toilet enclosures and **36-inch- (914-mm-)** wide, outswinging doors with a minimum **32-inch- (813-mm-)** wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening,

support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

- a. Pilasters and Panels or Screens: **1/2 inch (13 mm)**.
- b. Panels or Screens and Walls: **1 inch (25 mm)**.

2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than **[two brackets attached][three brackets attached at midpoint and]** near top and bottom of panel or screen.

- a. Locate wall brackets, so holes for wall anchors occur in masonry or tile joints.
- b. Align brackets at pilasters with brackets at walls.

3. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.

- a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
- b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than **2 inches (51 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust, so tops of doors are level with tops of pilasters when doors are in closed position.

D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust, so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust, so doors are level and aligned with panels, when doors are in closed position.

F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13 19



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Task	Specification	Specification Description
10 21 13 19	01 11 19 00	No Specification Required
10 21 13 19	10 21 13 13	Metal Toilet Compartments
10 21 13 19	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 40 - STONE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach **[ceiling-hung][floor-and-ceiling-anchored]** compartments to overhead structural system.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall**[and ceiling]** to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Stone toilet compartments:
 - a. Include data for each variety of stone and each type of stone accessory, door, hardware, bracket (fitting), and other manufactured product indicated. Submit product data as one coordinated submittal together with Shop Drawings.
 - 1) For stone, include data on physical properties required by referenced ASTM standards.
 - 2) For doors, hardware, and brackets (fittings), include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show**[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
6. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of **[stone][and][door finish]** indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: Actual sample of finished products for the following:

1. Stone: Sets for each color, grade, finish, and variety of stone required. Include **[two][three]** or more Samples in each set showing the full range of variations in appearance characteristics expected in the completed Work. **[Include two additional Samples in each set with surface sealer applied on them.]**
 - a. Size: **[Fabricators' standard size]<Insert size>**.
2. Doors: Corner sections with door faces and edges finished with materials proposed for the Work.
 - a. Size: **[Manufacturers' standard size]<Insert size>**.
3. Stile Reinforcement: Samples of aluminum splines.
 - a. Size: **[Manufacturers' standard size]<Insert size>**.
4. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

F. Delegated Design Submittals: For stone paneling assembly, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
2. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
3. Product Data: For adhesives, indicating VOC content.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Material Test Reports: For **[each]** stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, in accordance with referenced standards. Base reports on testing done within previous **[three][five]<Insert number>** years.

B. Qualification Statements: For **[fabricator][Installer]**.

C. Delegated design engineer qualifications.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stone toilet compartments. Include product data for stone-care products used or recommended by Installer as well as names, addresses, and telephone numbers of local sources for products.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
 - 1. Door Hinges: **[One]<Insert number>** hinge(s) with associated fasteners.
 - 2. Latch and Keeper: **[One]<Insert number>** latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: **[One]<Insert number>** bumper(s) with associated fasteners.
 - 4. Door Pull: **[One]<Insert number>** door pull(s) with associated fasteners.
 - 5. Fasteners: **[10]<Insert number>** fasteners of each size and type.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop **[accredited by NSI]** that employs skilled workers who custom-fabricate stone toilet compartments similar to those indicated for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: **[Fabricator of products][An experienced installer][accredited by NSI][who has completed stone toilet compartment installations similar in material, design, and extent to those indicated for this Project and whose installations have a record of successful in-service performance]**.
- C. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in **[state]<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
- B. Stack or brace stone on edge on leveled and adequate A-frames in a manner that prevents undue stresses in stone as well as chipping, cracking, and breaking.
- C. Cover stone with nonstaining, waterproof covers. Ventilate under covers to prevent condensation.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.



PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each variety of stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
- B. Obtain each variety of stone from single quarry, whether specified in this Section or in another Section of the Specifications.
- C. Make stone slabs available for Architect to examine for appearance characteristics.
 - 1. Architect will select aesthetically acceptable slabs and indicate aesthetically unacceptable portions of slabs.
 - 2. Segregate slabs selected for use on Project and mark backs indicating approval.
 - 3. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

2.2 PERFORMANCE REQUIREMENTS

- A. Regional Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site.
- B. Regional Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site.
- C. Regional Materials: Stone shall be fabricated within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered within **100 miles (160 km)** of Project site.
- D. Indigenous Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- E. Regional Materials: Stone shall be fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25][75][200]** or less.
 - 2. Smoke-Developed Index: 450 or less.
- G. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stone paneling system and supports.
- H. Stone Compartment Anchoring: Design stone anchors and anchoring systems in accordance with ASTM C1242.
- I. Seismic Performance: Stone paneling system must withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.

- J. Regulatory Requirements: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [and] [ICC A117.1] <Insert accessibility regulation> for toilet compartments designated as accessible.

2.3 STONE TYPES

- A. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with [Section 044200 "Exterior Stone Cladding."] [Section 097513 "Stone Wall Facing."]
- B. Variety and Source: Subject to compliance with requirements, provide stone complying with [Section 044200 "Exterior Stone Cladding."] [Section 097513 "Stone Wall Facing."]
- C. Marble: ; ASTM C503/C503M, Soundness Group A; selected for uniform visual quality[, having a maximum 0.1 percent absorption rate].
1. Description:
 - a. Uniform, fine- to medium-grained, [white][beige]<Insert color> stone with only slight veining.
 - b. [Uniform marble or limestone marble, matching Architect's sample]<Insert description>.
 2. Varieties and Sources: Subject to compliance with requirements, [provide the following][provide one of the following][available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert name of variety and producer, distributor, or importer>.
 3. Cut: [Vein][Fleuri].
 4. Finish: [Polished][Honed][Match Architect's sample].
- D. Granite: ; ASTM C615/C615M and complying with NBGQA's "Specifications for Architectural Granite"; free of cracks, defects, and geological flaws; and selected for uniform visual quality, having a maximum [0.1][0.2] percent absorption rate.
1. Description: Uniform, [fine][medium]-grained stone[without veining].
 - a. Color: [White][Pink][Gray][Black][Match Architect's sample]<Insert color>.
 2. Varieties and Sources: Subject to compliance with requirements, [provide the following][provide one of the following][available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert name of variety and producer, distributor, or importer>.
 3. Cut: [Vein][Fleuri].
 4. Finish: [Polished][Honed][Match Architect's sample].
- E. Quartz Agglomerate: ; solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article in ICPA SS-1.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Cambria]
 - b. [Cosentino North America; C&C North America, Inc.]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [LG Hausys, Ltd.]
 - e. [TechniStone; Wilsonart LLC]
 - f. [Transolid]
 - g. [Wilsonart LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Cambria]
 - b. [Cosentino North America; C&C North America, Inc.]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [LG Hausys, Ltd.]
 - e. [TechniStone; Wilsonart LLC]
 - f. [Transolid]
 - g. [Wilsonart LLC]
 - h. <Insert manufacturer's name>
3. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
- a. <Insert name of variety and producer, distributor, or importer>.
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.4 OTHER MATERIALS

- A. Brass Castings: ASTM B584.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- C. Stainless Steel Castings: ASTM A743/A743M.
- D. Particleboard: ANSI A208.1, Grade M-2.
 1. Particleboard shall be made without urea formaldehyde.
 2. Particleboard shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Particleboard shall be made without urea formaldehyde.
 4. Particleboard shall have formaldehyde emission rates not greater than 0.09 ppm when tested according to ASTM D6007 or ASTM E1333.
 5. Particleboard shall be made without urea formaldehyde.
- E. Plastic Laminate: ISO 4586-3, general-purpose HGS grade.

- F. Adhesives: Do not use adhesives that contain urea formaldehyde.
- G. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Adhesives: Do not use adhesives that contain urea formaldehyde.
- J. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 STONE TOILET COMPARTMENTS

- A. Stone Toilet Compartments: .
 - 1. Toilet-Enclosure Style: **[Floor anchored][Ceiling hung][Floor-and-ceiling anchored][Overhead braced]**.
 - 2. Entrance-Screen Style: **[Floor anchored][Ceiling hung][Floor-and-ceiling anchored][Overhead braced]**.
 - 3. Urinal-Screen Style: **[Floor anchored][Floor-and-ceiling anchored][Overhead braced]**.
 - 4. Stone Type: **<Insert stone type or stone drawing designation>**.
 - 5. Stone Veining: Cut stone so that, when installed, veining will be approximately **[vertical]<Insert direction>**.
 - 6. Doors: **[Plastic laminate][Stainless steel][Wood]**.
 - 7. Overhead Bracing: Fabricator's standard continuous, extruded-aluminum head rail with antigrip profile and in fabricator's standard finish.
 - 8. Hardware and Bracket (Fitting) Material and Finish: Fabricator's standard **[chrome-plated brass][stainless steel][polished brass]**.

2.6 DOORS AND HARDWARE

- A. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide inswinging doors for standard toilet compartments and **36-inch- (914-mm-)** wide outswinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for compartments designated as accessible.
- B. Plastic-Laminate Doors: One-piece, plastic-laminate facing sheets pressure laminated to core material without splices or joints in facings or cores; with laminate applied to edges before faces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[All American Metal Corp]**
 - b. **[American Sanitary Partition Corporation]**
 - c. **[ASI Accurate Partitions]**
 - d. **[ASI Global Partitions]**
 - e. **[Bobrick Washroom Equipment, Inc]**
 - f. **[Decolam]**

- g. [Flush Metal Partitions]
- h. [General Partitions Mfg. Corp]
- i. [Metpar Corp]
- j. [Weis/Robart Partitions, Inc.]
- k. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [All American Metal Corp]
- b. [American Sanitary Partition Corporation]
- c. [ASI Accurate Partitions]
- d. [ASI Global Partitions]
- e. [Bobrick Washroom Equipment, Inc]
- f. [Decolam]
- g. [Flush Metal Partitions]
- h. [General Partitions Mfg. Corp]
- i. [Metpar Corp]
- j. [Weis/Robart Partitions, Inc.]
- k. <Insert manufacturer's name>

- 3. Core Material: Particleboard.
- 4. Finished Door Thickness: Not less than **1 inch (25 mm)**.
- 5. Plastic-Laminate Color and Pattern: **[As selected by Architect from manufacturer's full range]<Insert color and pattern>**.

- C. Stainless Steel Doors: Seamless, stainless steel facing sheets pressure laminated to core material; with continuous, interlocking stainless steel molding strip or lapped and formed edge closures; corners secured by welding or clips, and exposed welds are ground smooth. Exposed surfaces must be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [All American Metal Corp]
- b. [American Sanitary Partition Corporation]
- c. [ASI Accurate Partitions]
- d. [ASI Global Partitions]
- e. [Bradley Corporation]
- f. [Flush Metal Partitions]
- g. [General Partitions Mfg. Corp]
- h. [Hadrian Inc.; Zurn Industries, LLC]
- i. [Metpar Corp]
- j. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [All American Metal Corp]
- b. [American Sanitary Partition Corporation]

- c. **[ASI Accurate Partitions]**
 - d. **[ASI Global Partitions]**
 - e. **[Bradley Corporation]**
 - f. **[Flush Metal Partitions]**
 - g. **[General Partitions Mfg. Corp]**
 - h. **[Hadrian Inc.; Zurn Industries, LLC]**
 - i. **[Metpar Corp]**
 - j. **<Insert manufacturer's name>**
3. Thickness of Facing Sheets: Manufacturer's standard, but not less than **0.031 inch (0.79 mm)**.
 4. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required for finished door thickness.
 5. Finished Door Thickness: Not less than **1 inch (25 mm)**.
 6. Stainless Steel Finish: **[Directional Satin Finish: ASTM A480/A480M, No. 4][Manufacturer's standard textured finish]<Insert finish>** on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.
- D. Wood Doors: As specified in **[Section 081416 "Flush Wood Doors."][Section 081433 "Stile and Rail Wood Doors."]**
- E. Wood Doors, Flush: **[Red-oak-][Birch-]<Insert wood species>** veneered, solid-core flush doors, **[1 inch (25 mm)]<Insert dimension>** thick; with particleboard core and hardwood edge bands bonded on all four edges; finished with **[transparent][opaque]** finish **[as selected by Architect from manufacturer's full range of colors and gloss][matching Architect's sample]**.
- F. Wood Doors, Stile and Rail: **[Cherry-][Maple-]<Insert wood species>** veneered, solid-core stile and rail doors, **[1-1/2 inches (38 mm)]<Insert dimension>** thick; with MDF core; finished with **[transparent][opaque]** finish **[as selected by Architect from manufacturer's full range of colors and gloss][matching Architect's sample]**. Stile and rail widths **[as indicated][manufacturer's standard]<Insert widths>**. **[Include mid rail.]**
- G. Wood Doors, Stile and Rail Louvered: **[Cherry-][Maple-]<Insert wood species>** veneered, solid-core stile and rail louvered doors, **[1-1/2 inches (38 mm)]<Insert dimension>** thick; with MDF core; finished with **[transparent][opaque]** finish **[as selected by Architect from manufacturer's full range of colors and gloss][matching Architect's sample]**. Stile and rail widths **[as indicated][manufacturer's standard]<Insert widths>**. **[Include mid rail.]** Louver widths **[as indicated][manufacturer's standard]<Insert widths>**.
- H. Hardware: Manufacturer's standard design, heavy-duty operating hardware and accessories, coordinated with actual thicknesses of stone and door and complying with the following:
1. Cutout-Inset-Type Hinges: Manufacturer's standard design, heavy-duty, paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees. Provide hinges that wrap around stone stiles for through-bolt attachment.
 2. Surface-Mounted Hinges: Manufacturer's standard design, heavy-duty, paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 3. Latch and Keeper: Manufacturer's standard design, heavy-duty **[recessed][surface-mounted]** latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at outswinging doors.
 6. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

2.7 ACCESSORIES

- A. Dowels: Stainless steel dowels; **1/4-inch (6-mm)** diameter; ASTM A276/A276M, Type 304.
- B. Brackets (Fittings): Fabricator's standard design, heavy-duty **[cast-brass][cast stainless steel]**, angle-type brackets (fittings), with **1-3/4-by-1-3/4-inch (44-by-44-mm)** legs, **1-1/4 inches (32 mm)** long, coordinated with actual thickness of stone, and capable of supporting stone units in configuration indicated.
- C. Stile Reinforcement: Continuous, **1/4-by-3/4-inch (6-by-19-mm)** extruded-aluminum spline complying with **ASTM B221 (ASTM B221M)** in alloy and temper recommended by fabricator for use indicated.
- D. Anchorages and Fasteners: Fabricator's standard design, heavy-duty exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type through bolts with lengths coordinated with actual thickness of stone or other material they are securing. For concealed anchors, use stainless steel or hot-dip galvanized steel.

2.8 FABRICATION

- A. Fabricate stone to sizes and shapes indicated on Drawings.
 - 1. For marble, comply with recommendations in NSI's "Dimension Stone Design Manual."
 - 2. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 - 3. Cut and drill sinkages and holes in stone for dowels, brackets (fittings), anchorages, and fasteners as indicated or needed to set stone securely in place. Drill holes for hardware and compartment-mounted accessories.
 - 4. Provide openings and similar features as needed to accommodate adjacent work.
- B. Cut stone from contiguous, matched slabs in which natural markings occur. Select and mark stone for final locations to produce assembled toilet compartments with an overall uniform appearance.
- C. Provide even (gaged) thicknesses indicated, but not less than the following:
 - 1. Panel and Screen Thickness: **[30][20]** mm.
 - 2. Stile Thickness: 30 mm.
- D. Cut stone with a surface tolerance of not more than plus or minimum 0.8 mm from true plane.
- E. Finish exposed faces and edges of stone to match approved Samples. Provide stone with eased, exposed edges.
- F. Ceiling-Hung Units: Reinforce each stile with a continuous, aluminum spline recessed flush in groove cut into the stone and located where panel abuts the stile so as to be concealed within the joint. Use adhesive and mechanical fasteners to attach spline to stone.
- G. Ceiling Anchorage: Provide corrosion-resistant anchoring assemblies complete with leveling adjustment nuts to connect stiles to structural support above finished ceiling. Provide assemblies that support stiles from structure without transmitting load to finished ceiling. Locate anchorage to be entirely concealed by the ceiling.
- H. Carefully inspect finished units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Coordinate layout and installation of supports, inserts, and anchors built into other units of work for stone toilet compartment anchorage.

3.2 INSTALLATION

- A. General: Comply with fabricator's written installation instructions. Install units rigid, straight, level, and plumb.
- B. Install anchors, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors and supports to set stone accurately in locations indicated, with uniform joints of widths indicated and with edges and faces aligned.
- C. Secure stone panels to walls and stiles with no fewer than three pairs of angle brackets (fittings), installed back to back. Use through-bolt fasteners to attach angle brackets (fittings) to stone. At wall connections, provide fasteners suitable for supporting construction.
- D. Do not allow stone to come in contact with plumbing sealant or putty.
- E. Floor-Anchored Units: Anchor units to floor rigid, level, and plumb.
 - 1. Hang doors and adjust so tops of doors are level with tops of stiles when doors are in closed position.
 - 2. Floor Anchorage: Set units onto finished floor as indicated, supported on structural floor. Secure each unit with no fewer than two dowels epoxied into unit and structural floor. Provide minimum **1-inch (25-mm)** dowel penetration of structural floor.
- F. Ceiling-Hung Units: Secure stiles to supporting structure with anchoring assembly, to connect stiles to structural support above finished ceiling as indicated, rigid, level, and plumb. Hang doors and adjust so bottoms of doors are level with bottoms of stiles when doors are in closed position.
- G. Floor-and-Ceiling-Anchored Units: Anchor units to floor rigid, level, and plumb; secure tops of stiles to supporting structure with anchoring assembly as indicated.
 - 1. Hang doors and adjust so tops of doors are level with each other when doors are in closed position and level with tops of partitions unless otherwise indicated.
 - 2. Floor Anchorage: Set units onto finished floor as indicated, supported on structural floor. Secure each unit with no fewer than two dowels epoxied into unit and structural floor. Provide minimum **1-inch (25-mm)** dowel penetration of structural floor.
- H. Overhead-Braced Units: Anchor units to floor rigid, level, and plumb; secure tops of stiles to continuous head rail with anchoring assembly as indicated. Hang doors to align tops of doors with tops of panels,

and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- I. Prepare joints and apply sealants, at locations indicated, to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/16 inch in 48 inches (1.5 mm in 1200 mm)**.
- B. Variation from Level: Do not exceed **1/8 inch in 96 inches (3 mm in 2400 mm)**, **1/4 inch (6 mm)** maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than one-fourth of nominal joint width.
- D. Variation in Line of Edge at Joints (Lipping): Do not exceed **1/64-inch (0.4-mm)** difference between edges of adjacent units, where edge line continues across joint.

3.4 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone toilet compartments as Work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone toilet compartments in a manner that results in units matching approved Samples, complying with other requirements, and showing no evidence of replacement. Remove and replace stone toilet compartments described below:
 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 2. Defective compartments.
 3. Defective joints, including misaligned joints.
 4. Stone not matching approved Samples.
 5. Stone toilet compartments not complying with other requirements indicated.
- C. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.
- D. Clean stone toilet compartments no fewer than **[six]<Insert number>** days after completion of **[sealant installation][installation]**, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone; follow methods recommended by NSI.

END OF SECTION 10 21 13 40



Task	Specification	Specification Description
10 21 13 40	01 11 19 00	No Specification Required
10 21 13 40	10 21 13 13	Metal Toilet Compartments
10 21 13 40	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 13 43 - PHENOLIC-CORE PEDESTAL-MOUNTED PRIVACY TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core pedestal-mounted privacy toilet compartments.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for blocking.
2. Section 092216 "Non-Structural Metal Framing" for blocking.
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data.

1. Phenolic-core pedestal-mounted privacy toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. **<Insert requirements>.**

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

- D. Samples for Verification: Actual sample of finished products for each type of toilet compartment, hardware, and accessory.

1. Size: **[Manufacturers' standard size]<Insert size>.**



- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.
- G. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declaration (EPD): For each product.
 - 4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 5. Environmental Product Declaration: For each product.
 - 6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
 - 7. Environmental Product Declaration: For each product.
 - 8. Environmental Product Declaration: For each product.
 - 9. Third-Party Certifications: For each product.
 - 10. Third-Party Certified Life Cycle Assessment: For each product.
 - 11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.
 - 12. Low-Emitting Materials: Provide testing reports in accordance with the General Emissions Evaluation.
 - 13. Product Data: For product, indicating that product contains no urea formaldehyde.
 - 14. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
 - 15. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
 - 16. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.
 - 17. Product Data: For product, indicating that product contains no urea formaldehyde.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: [One]<Insert number> hinge(s) with associated fasteners.
 - 2. Latch and Keeper: [One]<Insert number> latch(es) and keeper(s) with associated fasteners.

3. Door Bumper: [One]<Insert number> door bumper(s) with associated fasteners.
4. Door Pull: [One]<Insert number> door pull(s) with associated fasteners.
5. Fasteners: [10]<Insert number> fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain phenolic-core pedestal-mounted privacy toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Product shall be made without urea formaldehyde.
- H. Product shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Product shall be made without urea formaldehyde.



- J. Product shall have formaldehyde emission rates not greater than 0.09 ppm when tested according to ASTM D 6007 or ASTM E 1333.
- K. Product shall be made without urea formaldehyde.
- L. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25][75][200]** or less.
 - 2. Smoke-Developed Index: 450 or less.
- M. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.
- N. Regulatory Requirements: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]****<Insert accessibility regulation>** for toilet compartments designated as accessible.

2.3 PHENOLIC-CORE PEDESTAL-MOUNTED PRIVACY TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[ASI Accurate Partitions]**
 - 2. **[ASI Global Partitions]**
 - 3. **[Bobrick Washroom Equipment, Inc]**
 - 4. **[Bradley Corporation]**
 - 5. **[Decolam]**
 - 6. **[EAD Design]**
 - 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[ASI Accurate Partitions]**
 - 2. **[ASI Global Partitions]**
 - 3. **[Bobrick Washroom Equipment, Inc]**
 - 4. **[Bradley Corporation]**
 - 5. **[Decolam]**
 - 6. **[EAD Design]**
 - 7. **<Insert manufacturer's name>**
- C. Toilet-Enclosure Style: Overhead-braced, floor-anchored pedestal supports. Privacy-type doors, panels, and pilasters.
- D. Entrance-Screen Style: Overhead-braced, floor-anchored pedestal supports.
- E. Urinal-Screen Style: Wall-hung, floor-anchored pedestal supports.

- F. Door, Panel and Pilaster Construction: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum **1/2-inch- (13-mm-)** thick doors, panels, and pilasters. Provide with **[manufacturer's standard]<Insert requirements>** no-sightline system at door and pilaster edges.
- G. Entrance-Screen Construction: Matching panel construction.
- H. Urinal-Screen Construction: Matching panel construction.
- I. Pedestal: Manufacturer's standard design.
 - 1. Pedestal Material: **[Manufacturer's standard]<Insert requirements>**.
- J. Brackets (Fittings): Manufacturer's standard design full-height (continuous) type.
 - 1. Bracket Material: **[Manufacturer's standard]<Insert requirements>**.
- K. Phenolic Finish: **[One color][Two colors]** in each room.
 - 1. Dark-Core Phenolic: Manufacturer's standard dark color core and edge.
 - a. Facing Sheet Color: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.
 - 2. Through-Color Phenolic: Manufacturer's standard solid through-color.
 - a. Color: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.
 - 1. Hinges: **[Manufacturer's standard]<Insert requirements>**, allowing emergency access by lifting door.
 - 2. Latch and Keeper: **[Manufacturer's standard]<Insert requirements>** surface-mounted latch unit with occupancy indicator, designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
 - 3. Coat Hook: **[Manufacturer's standard]<Insert requirements>** combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 - 4. Door Bumper: **[Manufacturer's standard]<Insert requirements>** rubber-tipped bumper at outswinging doors.
 - 5. Door Pull: **[Manufacturer's standard]<Insert requirements>** pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum headrail **[with antigrip profile and]** in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-

resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pedestals and walls to suit floor and wall conditions.
- C. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide inswinging doors for standard toilet enclosures and **36-inch- (914-mm-)** wide outswinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Panels or Screens and Walls: **1 inch (25 mm)**.
 - 2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.

- a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Secure pedestals to floor and level, plumb, and tighten. Set pedestals with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13 43



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Task	Specification	Specification Description
10 21 13 43	01 11 19 00	No Specification Required
10 21 13 43	10 21 13 13	Metal Toilet Compartments
10 21 13 43	10 21 23 00	Cubicle Curtains and Track
10 21 16 00	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 16 17 - PHENOLIC-CORE SHOWER AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core shower and dressing compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to the overhead structural system.
2. Section 061000 "Rough Carpentry" for **[blocking][and][overhead support of floor-and-ceiling-anchored compartments]**.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on compartments.
5. Section 105113 "Metal Lockers" for dressing compartment benches.
6. Section 224200 "Commercial Plumbing Fixtures" for shower heads, valves, and receptors.

1.2 COORDINATION

- A. Coordinate requirements for **[overhead supports,]**blocking, reinforcing, and other supports concealed within wall **[and ceiling]** to ensure that compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show locations of cutouts for compartment-mounted accessories.
3. Show locations of centerlines of drains.
4. Show **[ceiling grid, ceiling-mounted items, and]** overhead support or bracing locations.
5. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available finishes for each type of compartment.

1. Include Samples of hardware and accessories involving material and color selection.

- D. Samples for Verification: Actual sample of finished product for each type of compartment, hardware, and accessory.

1. Size: **[Manufacturers' standard size]**<Insert size>.

E. Delegated Design Submittals: For **[grab bars][shower seats][and][accessible benches]** mounted on compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

F. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): For each product.
2. Health Product Declaration (HPD): For each product.
3. Environmental Product Declaration (EPD): For each product.
4. Health Product Declaration (HPD): For each product.
5. Environmental Product Declaration (EPD): For each product.
6. Environmental Product Declaration (EPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Third-Party Certifications: For each product.
9. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For phenolic panel, by a qualified testing agency.
- B. Delegated design engineer qualifications.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For shower and dressing compartments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Door Hinges: **[One]**<Insert number> door hinge(s) with associated fasteners.
 2. Latch and Keeper: **[One]**<Insert number> latch(es) and keeper(s) with associated fasteners.
 3. Clothing Hook: **[One]**<Insert number> clothing hook(s) with associated fasteners.
 4. Door Bumper: **[One]**<Insert number> door bumper(s) with associated fasteners.
 5. Door Pull: **[One]**<Insert number> door pull(s) with associated fasteners.
 6. Fasteners: **[10]**<Insert number> fasteners of each size and type.
 7. Curtain Rod: **[One]**<Insert number> curtain rod(s) with associated fasteners.
 8. Curtain Hooks: **[Five]**<Insert number> curtain hooks.
 9. Soap Holder: **[One]**<Insert number> soap holder(s) with associated fasteners.

1.7 QUALITY ASSURANCE

- A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in

[state]<Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of fixtures, drains, walls, columns, ceilings, and other construction contiguous with shower and dressing compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain shower and dressing compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25][75][200]** or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to provide structural design calculations for grab bars, shower seats, or seats of accessible benches mounted on shower or dressing compartment panels.
- C. Structural Performance: Where grab bars, shower seats, or accessible benches are mounted on shower or dressing compartment panels, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar, shower seat, or seat of accessible bench of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.
- D. Regulatory Requirements: Comply with applicable provisions in **[the DOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]**<Insert accessibility regulation> for shower and dressing compartments designated as accessible.
- E. Regional Materials: Verify products are manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- F. Regional Materials: Verify products are manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.

2.3 PHENOLIC-CORE SHOWER AND DRESSING COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [All American Metal Corp]
2. [ASI Accurate Partitions]
3. [ASI Global Partitions]
4. [EAD Design]
5. [Flush Metal Partitions]
6. [General Partitions Mfg. Corp]
7. [Knickerbocker Partition Corporation]
8. [Metpar Corp]
9. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [All American Metal Corp]
2. [ASI Accurate Partitions]
3. [ASI Global Partitions]
4. [EAD Design]
5. [Flush Metal Partitions]
6. [General Partitions Mfg. Corp]
7. [Knickerbocker Partition Corporation]
8. [Metpar Corp]
9. <Insert manufacturer's name>

C. Configuration: [Shower compartment(s)][Shower and dressing compartment(s)][with manufacturer's precast terrazzo shower receptor,] as indicated on Drawings.

1. Precast Terrazzo Shower Receptor: Manufacturer's standard, prefabricated, terrazzo receptor complete with integral brass drain and removable stainless steel strainer. Designed to receive panels and create a waterstop when panels are in place.
 - a. Curb: Not less than **2 inches (51 mm)** and not more than **9 inches (229 mm)** deep when measured from the top of the curb to the top of the drain; with curb threshold not less than **1 inch (25 mm)** below the sides and back of the receptor; **and with a ramped entrance surface for accessible compartments**.
 - b. Finish: Manufacturer's standard finish on exposed surfaces, [matching color of compartment panels][as indicated by manufacturer's designations][as selected by Architect from manufacturer's full range]<Insert requirement> and with slip-resistant floor surface texture.

D. Compartment Style: [Overhead braced][Floor and ceiling anchored][, privacy type]<Insert style>.

E. Panel Construction: Solid phenolic-core panel material with melamine facing on both sides fused together during panel manufacture (not separately laminated) and with eased and polished edges. Provide minimum **1/2-inch- (13-mm-)** thick panels.

F. Pilaster Construction: Match panels; **3/4-inch- (19-mm-)** minimum thickness.

G. Door Construction: Match panels; **3/4-inch (19-mm)** minimum thickness.[**Equip door and pilasters with lapped edge no-sightline system.**]

H. Pilaster Shoes: Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.

- I. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.
- J. Brackets (Fittings):
 - 1. Shower Compartment Brackets:
 - a. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
 - 2. Dressing Compartment Brackets:
 - a. Match shower compartment brackets.
 - b. Stirrup Type: Ear or U-brackets; stainless steel.
 - c. Match toilet-compartment brackets specified in Section 102113.17 "Phenolic-Core Toilet Compartments."
- K. Phenolic Compartment Finish: **[One color][Two colors]** in each room.
 - 1. Dark-Core Phenolic: Manufacturer's standard dark color core and edge.
 - a. Facing Sheet Color: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.
 - 2. Through-Color Phenolic: Manufacturer's standard solid through-color.
 - a. Color: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. **[Mount with through bolts.]**
 - 1. Hinges: **[Manufacturer's stainless steel, surface-mounted, paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees][Manufacturer's stainless steel continuous, cam type that swings to a closed or partially open position][Manufacturer's stainless steel continuous, spring-loaded type][Manufacturer's standard]<Insert requirement>**, allowing emergency access by lifting door.
 - 2. Latch and Keeper: Manufacturer's standard, stainless steel, surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility **[at each compartment, accessible or not][at compartments designated as accessible]**.
 - 3. Clothing Hooks: Manufacturer's standard stainless steel clothing hooks in each dressing compartment **[; include one combination hook and rubber-tipped bumper at inswinging doors, sized to prevent door from hitting wall panel or compartment-mounted accessories]**.
 - 4. Door Bumper: Manufacturer's standard stainless steel, rubber-tipped bumper at outswinging doors.
 - 5. Door Pull: Manufacturer's standard stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with antigrip profile; in manufacturer's standard finish.

- C. Headrail with Hooks: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with curtain hooks running in concealed track; with antigrip profile; in manufacturer's standard finish.
- D. Curtain Rod with Hooks: Manufacturer's standard, 1-inch- (25-mm-) diameter, **[stainless steel]<Insert material>** curtain rod with matching hooks.
- E. Curtain: Flame-resistant, **[polyester-reinforced vinyl fabric][manufacturer's standard fabric]<Insert fabric>** that is stain resistant, self-sanitizing, antistatic, antimicrobial, and launderable to a temperature of not less than **[90 deg F (32 deg C)]<Insert temperature>**.
 - 1. Flame Resistance: Passes NFPA 701 tests when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Labeling: Identify fabrics with appropriate markings of applicable testing and inspecting agency.
 - 3. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than **6 inches (152 mm)** o.c.; machined into top hem.
 - 4. Width: Minimum **[6 inches (152 mm)][12 inches (305 mm)]** wider than opening.
 - 5. Length: Where curtain extends to a floor surface, size so that bottom hem clears finished floor by not more than **1 inch (25 mm)** and not less than **1/2 inch (13 mm)** above floor surface. Where curtains extend to a shower-receptor curb, size so that bottom hem hangs above curb line and clears curb line by not more than **1/2 inch (13 mm)**.
 - 6. Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
- F. Soap Holder:
 - 1. Manufacturer's standard.
 - 2. **[Surface-mounted][Recessed]**, seamless **[stainless steel]<Insert material>** soap dish.
- G. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, chrome-plated steel, or solid brass, finished to match the items they are securing; with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. Use countersunk, flush-type bolt heads or otherwise make fasteners inconspicuous if exposed on opposite side of panel from hardware or accessory item. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

- A. Fabricate shower and dressing compartment components to sizes indicated.
- B. Overhead-Braced Compartments: Manufacturer's standard, corrosion-resistant supports, leveling

method, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling method.

- C. Floor-and-Ceiling-Anchored Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- D. Door Sizes and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide, inswinging doors for standard shower and dressing compartments, and **36-inch- (914-mm-)** wide, outswinging doors with a minimum **32-inch- (813-mm-)** wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PHENOLIC-CORE SHOWER AND DRESSING COMPARTMENTS

- A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.
 - 1. Clearances for Dressing Compartments: Maximum **1/2 inch (13 mm)** between pilasters and panels; **1 inch (25 mm)** between panels and walls.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than **[two brackets attached][three brackets attached at midpoint and]** near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Compartments: Secure pilasters to floor, and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous headrail to each pilaster with no fewer than two fasteners. **[Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.]**
- C. Floor-and-Ceiling-Anchored Compartments: Secure pilasters to supporting construction, and level, plumb, and tighten. **[Hang doors and adjust so doors are level and aligned with panels when**

doors are in closed position.]

- D. Curtains: Install curtains to specified length, and verify that they hang vertically without stress points or diagonal folds.
- E. Shower Receptors: Install manufacturer's prefabricated shower receptors with drain gasket compression fit to OD of waste pipe.

3.3 ADJUSTING AND CLEANING

- A. Curtain Adjustment: After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.
- B. Hardware Adjustment: Clean, adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.
- C. Clean exposed surfaces of compartments after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering and for cleaning. Replace damaged or defective items.

END OF SECTION 10 21 16 17



Task	Specification	Specification Description
10 21 16 17	10 21 13 13	Metal Toilet Compartments
10 21 16 17	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 21 23 00 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cubicle-curtain support systems.
2. Cubicle curtains.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.
2. Section 092216 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Cubicle-curtain support systems.
2. Cubicle curtains.

B. Product Data Submittals: For each product.

1. For each type of curtain fabric indicated, include durability, laundry temperature limits, fade resistance, applied curtain treatments, and fire-test-response characteristics.

C. Shop Drawings: For curtains and tracks.

1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
2. Include details of blocking for track support.

D. Samples: For each exposed product and for each color and texture specified, **10 inches (254 mm) in size.**

E. Samples for Initial Selection: For each type of curtain material indicated.

F. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

1. Curtain Fabric: Not less than **10 inches (254 mm)** square and showing complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than **10 inches (254 mm)** square.
3. Curtain Track: Not less than **10 inches (254 mm)** long.
4. Curtain Carrier: Full-size unit.

G. Product Schedule: For curtains and tracks.[Use same designations indicated on Drawings].

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For curtains, tracks, and hardware to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Curtain Carriers and Track End Caps: Full-size units equal to [3]<Insert number> percent of amount installed for each size indicated, but no fewer than [10]<Insert number> units.
 - 2. Curtains: Full-size units equal to [10]<Insert number> percent of amount installed for each size indicated, but no fewer than [two]<Insert number> units.

1.5 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical cubicle as shown on Drawings[**as part of patient-room mockup**].
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Laundering: Launderable to a water temperature of not less than [160 deg F (71 deg C)]<Insert temperature>.
 - 2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [Alderman Acres Manufacturing, Inc.]
 - 2. [AR Nelson]
 - 3. [Automatic Devices Company]
 - 4. [Barjan Manufacturing Ltd.]

5. [Construction Specialties, Inc.]
 6. [Covoc Corporation]
 7. [Cubicle Curtain Factory, Inc]
 8. [Erwin and Associates, Inc]
 9. [Healthcare Curtains]
 10. [Imperial Fastener Company, Inc.]
 11. [inpro Corporation]
 12. [Pryor Products, Inc.]
 13. [Standard Textile Co., Inc.]
 14. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Alderman Acres Manufacturing, Inc.]
 2. [AR Nelson]
 3. [Automatic Devices Company]
 4. [Barjan Manufacturing Ltd.]
 5. [Construction Specialties, Inc.]
 6. [Covoc Corporation]
 7. [Cubicle Curtain Factory, Inc]
 8. [Erwin and Associates, Inc]
 9. [Healthcare Curtains]
 10. [Imperial Fastener Company, Inc.]
 11. [inpro Corporation]
 12. [Pryor Products, Inc.]
 13. [Standard Textile Co., Inc.]
 14. <Insert manufacturer's name>
- C. Extruded-Aluminum Curtain Track: Not less than [1-1/4 inches wide by 3/4 inch high (32 mm wide by 19 mm high)][5/8 inch wide by 1/2 inch high (16 mm wide by 13 mm high)].
1. Track Minimum Wall Thickness: [0.050 inch (1.27 mm)][0.058 inch (1.47 mm)][0.062 inch (1.57 mm)][Manufacturer's standard]<Insert dimension>.
 2. Curved Track: Factory-fabricated, [12-inch- (305-mm-)]<Insert radius> radius bends.
 3. Finish: [Clear anodized][Satin anodized][Baked enamel, acrylic, or epoxy]<Insert finish>.
- D. PVC Curtain Track: Not less than 1-1/4 inches wide by 15/16 inch high (32 mm wide by 24 mm high).
1. Curved Track: Factory-fabricated, 12-inch- (305-mm-) radius bends.
- E. Curtain-Track Mounting: [Surface][Suspended][As indicated on Drawings].
- F. Curtain-Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
1. Suspended-Track Support: Not less than [5/8-inch- (16-mm-) square][7/8-inch- (22.2-mm-) OD] tube.
 2. End Stop: [Nonremovable][Removable with carrier hook].
 3. Switch Unit: Shuttle and coupling device for rerouting and securing cubicle curtain, with pull chain for switching track.
- G. Curtain Roller Carriers: Two nylon rollers and nylon axle with [chrome-plated steel][nylon][aluminum] hook.

10 - Specialties



- H. Curtain Glide Carriers: One-piece nylon glide with **[chrome-plated steel][nylon]** hook.
- I. Breakaway Curtain Carriers: **[One-piece nylon][Velcro]** breakaway curtain carriers designed to allow curtains to detach from tracks with a pulling force of no more than 5 lbf (22.2 N).
- J. Exposed Fasteners: Stainless steel.
- K. Concealed Fasteners: **[Hot-dip galvanized][Stainless steel]**.

2.3 CUBICLE CURTAINS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1. **[Alderman Acres Manufacturing, Inc.]**
- 2. **[AR Nelson]**
- 3. **[Automatic Devices Company]**
- 4. **[Barjan Manufacturing Ltd.]**
- 5. **[Covoc Corporation]**
- 6. **[Cubicle Curtain Factory, Inc]**
- 7. **[Erwin and Associates, Inc]**
- 8. **[Healthcare Curtains]**
- 9. **[Imperial Fastener Company, Inc.]**
- 10. **[inpro Corporation]**
- 11. **[Pryor Products, Inc.]**
- 12. **[Salsbury Industries]**
- 13. **[Sereneview & Catalina Curtain Co.]**
- 14. **[Standard Textile Co., Inc.]**
- 15. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1. **[Alderman Acres Manufacturing, Inc.]**
- 2. **[AR Nelson]**
- 3. **[Automatic Devices Company]**
- 4. **[Barjan Manufacturing Ltd.]**
- 5. **[Covoc Corporation]**
- 6. **[Cubicle Curtain Factory, Inc]**
- 7. **[Erwin and Associates, Inc]**
- 8. **[Healthcare Curtains]**
- 9. **[Imperial Fastener Company, Inc.]**
- 10. **[inpro Corporation]**
- 11. **[Pryor Products, Inc.]**
- 12. **[Salsbury Industries]**
- 13. **[Sereneview & Catalina Curtain Co.]**
- 14. **[Standard Textile Co., Inc.]**
- 15. **<Insert manufacturer's name>**

- C. Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.

- 1. Pattern: **<Insert manufacturer's style name>**.

2. Width: **<Insert dimension>**.
3. Color: **[As selected by Architect from manufacturer's full range]<Insert requirements>**.
- D. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than **6 inches (152 mm)** o.c.; machined into top hem.
- E. Mesh Top: Not less than **[20-inch- (508-mm-)][22-inch- (559-mm-)]<Insert dimension>** high mesh top.
 1. Mesh: No. **[50][40][42]** nylon mesh.
- F. Beaded-Chain Curtain Drop: **[6 inches (152 mm)][9 inches (229 mm)][12 inches (305 mm)][15 inches (381 mm)][18 inches (457 mm)]** long; nickel-plated steel with aluminum hook.
- G. PVC-Strip Curtain Drop: **[16 inches (406 mm)][18 inches (457 mm)]** long with chrome-plated steel hook.
- H. Snap Attachments: Provide manufacturer's standard nickel-plated brass snap attachments for modular panels.
- I. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

A. Continuous Curtain Panels:

1. Width: Equal to track length from which curtain is hung plus 10 percent of added fullness, but not less than **12 inches (305 mm)** of added fullness.
2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of **[12 inches (305 mm)][15 inches (381 mm)][As indicated on Drawings]<Insert requirements>**.
3. Top Hem: Not less than **1 inch (25.4 mm)** and not more than **1-1/2 inches (38 mm)** wide, triple thickness, reinforced with integral web, and double lockstitched.
4. Mesh Top: Top hem of mesh not less than **1 inch (25.4 mm)** and not more than **1-1/2 inches (38 mm)** wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to **1/2-inch (13-mm)** triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than **1 inch (25.4 mm)** and not more than **1-1/2 inches (38 mm)** wide, **[double thickness and single][double thickness and double][triple thickness, reinforced, and double]** lockstitched.
6. Side Hems: Not less than **1/2 inch (13 mm)** and not more than **1-1/4 inches (32 mm)** wide, with **[double][triple]** turned edges, and single lockstitched.
7. Vertical Seams: Not less than **1/2 inch (13 mm)** wide, double turned and double stitched.

B. Modular Curtain Panels:

1. Fabric Panels: **[48 inches (1219 mm)][66 inches (1676 mm)]<Insert dimension>** wide. Fabricate panels in quantity required to provide assembled curtains equal to track lengths plus 10 percent added fullness, but not less than **12 inches (305 mm)** added fullness.
 - a. Top Hem: Not less than **1 inch (25.4 mm)** and not more than **1-1/2 inches (38 mm)** wide, triple thickness, reinforced with integral web, double lockstitched, and with snap attachments to attach panels to mesh top.
 - b. Side Hems: Not less than **1/2 inch (13 mm)** and not more than **1-1/4 inches (32 mm)** wide, with double turned edges, single lockstitched, and **[designed for panels hung with overlapping side hems for privacy][with snap attachments to attach one panel to another]**.



2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of **[12 inches (305 mm)][15 inches (381 mm)][As indicated on Drawings]<Insert requirements>**.
3. Mesh Top: Top hem of mesh not less than **1 inch (25.4 mm)** and not more than **1-1/2 inches (38 mm)** wide, triple thickness, reinforced with integral web, and double lockstitched.
 - a. Type: **[Continuous for each track length, matching overall width of assembled curtains][Modular, matching width of modular fabric panels with snap attachments at side hems of mesh-top panels]**.
4. Vertical Seams: Not less than **1/2 inch (13 mm)** wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install tracks level and plumb, according to manufacturer's written instructions.
- B. For tracks of up to **20 feet (6.0 m)** in length, provide track fabricated from single, continuous length.
 1. Curtain-Track Mounting: **[Surface][Suspended][As indicated on Drawings]**.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 1. Mechanically fasten directly to bottom of concrete deck with post-installed anchors.
 2. Mechanically fasten directly to finished ceiling with toggle bolts.
 3. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
 4. Mechanically fasten to suspended ceiling grid with screws.
 5. Attach track to suspended ceiling grid with manufacturer's proprietary clip.
- D. Suspended-Track Mounting: Install track with manufacturer's standard tubular aluminum suspended supports at intervals and with fasteners recommended by manufacturer. Fasten supports to structure. Provide supports at each splice and tangent point of each corner. Secure ends of track to wall with flanged fittings or brackets.
- E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
 1. Provide one locking switch unit for each pair of beds.
 2. Provide one hinged loading unit for each **[bed][pair of beds with locking switch unit]**.
- F. Curtain Carriers: Provide curtain carriers adequate for **6-inch (152-mm)** spacing along full length of



curtain plus an additional carrier.

- G. Cubicle Curtains: Hang curtains on each curtain track.[**Secure with curtain tieback.**]

END OF SECTION 10 21 23 00



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Task	Specification	Specification Description
10 21 23 13	10 21 23 00	Cubicle Curtains and Track
10 21 23 16	10 21 23 00	Cubicle Curtains and Track



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SECTION 10 22 00 00 - FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Operable acoustical panel partitions.
2. Operable fire-rated panel partitions.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.
2. Section 092900 "Gypsum Board" for fire-rated assemblies and sound barrier construction above the ceiling at track.
3. Section 102226.13 "Accordion Folding Partitions" for accordion-type folding partitions having a pantograph mechanism and outer flexible covering, or narrow, vertically hinged segments.
4. Section 102239.13 "Folding Glass-Panel Partitions" for operable panel partitions made of glass panels.
5. Electrical and communications Sections for electrical service and connections for motor operators, controls, and limit switches and for system disconnect switches.

1.2 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Operable acoustical panel partitions.
2. Operable fire-rated panel partitions.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.

4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
7. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
8. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For operable panel partitions.

1. Include plans, elevations, sections, attachment details[, **and numbered panel installation sequence**].
2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
3. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Textile Facing Material: Full width by not less than **36-inch- (914-mm-)** long section of **[fabric][carpet]** from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
2. Panel Facing Material: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
3. Panel Edge Material: Not less than **3 inches (75 mm)** long.
4. Chair Rail: Manufacturer's standard-size unit, **6 inches (150 mm)** long.
5. Glass: Units **12 inches (300 mm)** square.
6. Hardware: One of each exposed door-operating device.

F. Delegated Design Submittals: For operable panel partitions.

1. Include design calculations for seismic restraints that brace tracks to structure above.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.

- d. Sprinklers.
 - e. Smoke detectors.
 - f. Access panels.
 - g. <Insert item>.
 - 6. Plenum **[fire][smoke][and][acoustical]** barriers.
 - B. Setting Drawings: For embedded items and cutouts required in other work[, **including support-beam, mounting-hole template**].
 - C. Qualification Data: For **[Installer][testing agency]**.
 - D. Seismic Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:
 - 1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, in accordance with ASCE/SEI 7.
 - 2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.
 - E. Product Certificates: For each type of operable panel partition.
 - 1. Include approval letter signed by manufacturer acknowledging Owner-furnished panel facing material complies with requirements.
 - F. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.
 - G. Field quality-control reports.
 - H. Sample Warranty: For manufacturer's special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, track switches, carriers, and other operating components.
 - c. Electric operator and controls.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.



1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: **[Two][Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic bracing of tracks to structure above.
- B. Seismic Performance: Operable panel partitions are to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.
 - 1. The term "withstand" means "the partition panels will remain in place without separation of any parts when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties in accordance with test methods indicated:

1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance in accordance with ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.
 2. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance in accordance with ASTM C423, and rated for not less than the NRC indicated.
 3. Noise-Isolation Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC in accordance with ASTM E336, determined by ASTM E413, and rated for **[10 dB less than STC value indicated]<Insert value>**.
- D. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction:
1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **[25]<Insert value>** or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
 2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested in accordance with **[NFPA 265 Method B Protocol][or][NFPA 286]**.
- E. Fire Resistance: Provide fire-rated operable panel partition assemblies **[including pass doors]** complying with NFPA 80, based on testing in accordance with UL 10B for fire-rated door assemblies.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Pass doors in fire-rated operable panel partition assemblies are to meet positive-pressure requirements.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 OPERABLE ACOUSTICAL PANEL PARTITIONS

- A. Operable Acoustical Panel Partitions : Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advanced Equipment Corporation]**
 - b. **[KWIK-WALL Company]**
 - c. **[Moderco Inc]**
 - d. **[Modernfold, Inc]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Advanced Equipment Corporation]**
 - b. **[KWIK-WALL Company]**
 - c. **[Moderco Inc]**
 - d. **[Modernfold, Inc]**
 - e. **<Insert manufacturer's name>**
- B. Panel Operation: **[Manually operated, individual][Manually operated, paired][Manually operated, continuously hinged][Electrically operated, continuously hinged]** panels.
- C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
1. Panel Width: **[Standard widths][Equal widths][As indicated]**.
- E. STC: Not less than **[38][41][45][47][50][52][54][56]<Insert number>**.
- F. NRC: Not less than **[0.50][0.60][0.65][0.90]<Insert number>**.
- G. Panel Weight: **[8 lb/sq. ft. (40 kg/sq. m)][10 lb/sq. ft. (50 kg/sq. m)][12 lb/sq. ft. (59 kg/sq. m)]<Insert value>** maximum.
- H. Panel Thickness: **[Maximum][Minimum][Nominal]** dimension of **[3 inches (75 mm)][3-1/2 inches (89 mm)][4 inches (102 mm)]<Insert dimension>**.
- I. Panel Materials:
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
 2. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
 3. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
 4. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
 5. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
 6. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 7. Adhesives: Do not use adhesives that contain urea formaldehyde.
 8. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 9. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile

- Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
10. Adhesives: Do not use adhesives that contain urea formaldehyde.
 11. Adhesives: Do not use adhesives that contain urea formaldehyde.
 12. Composite Wood Products: Products shall be made without urea formaldehyde.
 13. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 14. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 15. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 16. Composite Wood Products: Products shall be made without urea formaldehyde.
 17. Steel Frame: Steel sheet, **[manufacturer's standard][0.0508-inch (1.3-mm)][0.0641-inch (1.6-mm)][0.0747-inch (1.9-mm)]<Insert dimension>** nominal minimum thickness for uncoated steel.
 18. Steel Face/Liner Sheets: Tension-leveled steel sheet, **[manufacturer's standard][0.0299-inch (0.75-mm)][0.0359-inch (0.9-mm)][0.0478-inch (1.2-mm)][0.0598-inch (1.5-mm)][0.0747-inch (1.9-mm)]<Insert dimension>** minimum nominal thickness for uncoated steel.
 19. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; **ASTM B221 (ASTM B221M)** for extrusions; manufacturer's standard strengths and thicknesses for type of use.
 - a. Frame Reinforcement: Manufacturer's standard steel or aluminum.
 20. Gypsum Board: ASTM C1396/C1396M.
 21. Cement Board: ASTM C1288.
 22. Particleboard: ANSI A208.1.
 23. Medium-Density Fiberboard: ANSI A208.2.
 24. Plywood: DOC PS 1.
- J. Panel Closure: Manufacturer's standard unless otherwise indicated.
1. Initial Closure: **[Resilient, bulb-shaped acoustical seal][Fixed jamb][As indicated]<Insert description>**.
 2. Final Closure: **[Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal][Hinged jamb closure][Hinged communicating panel][Fixed jamb][Angle jamb][Resilient, bulb-shaped acoustical seal]<Insert description>**.
- K. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.
1. Hinges: **[Manufacturer's standard][Concealed (invisible)]<Insert type>**.
 2. **<Insert hardware requirement>**.
- L. Finish Facing: **[Owner furnished][Vinyl-coated fabric wall covering][Carpet wall covering][Fabric wall covering][High-pressure decorative laminate][Wood veneer][Paint]<Insert finish>**.

2.3 OPERABLE FIRE-RATED PANEL PARTITIONS

- A. Operable Fire-Rated Panel Partitions : Fire-rated, acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advanced Equipment Corporation]**
 - b. **[Modernfold, Inc]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advanced Equipment Corporation]**
 - b. **[Modernfold, Inc]**
 - c. **<Insert manufacturer's name>**
- B. Panel Operation: Manually operated, **[individual][paired]** panels.
- C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable fire-rated panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
1. Panel Width: **[Standard widths][Equal widths][As indicated]**.
- E. Fire Rating: **[1]<Insert number>** hour(s).
- F. STC: Not less than **[38][41][45][47][50][52][54]<Insert number>**.
- G. NRC: Not less than **[0.50][0.60][0.65][0.90]<Insert number>**.
- H. Panel Weight: **[8.5 lb/sq. ft. (41.5 kg/sq. m)][10 lb/sq. ft. (50 kg/sq. m)][12 lb/sq. ft. (59 kg/sq. m)]<Insert value>** maximum.
- I. Panel Thickness: **[Maximum][Minimum][Nominal]** dimension of **[3 inches (75 mm)][3-1/2 inches (89 mm)][4 inches (102 mm)]<Insert dimension>**.
- J. Panel Materials:
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
 2. Steel Frame: Steel sheet, **[manufacturer's standard][0.0508-inch (1.3-mm)][0.0641-inch (1.6-mm)][0.0747-inch (1.9-mm)]<Insert dimension>** nominal minimum thickness for uncoated steel.
 3. Steel Face/Liner Sheets: Tension-leveled steel sheet, **[manufacturer's standard][0.0299-inch (0.75-mm)][0.0359-inch (0.9-mm)][0.0478-inch (1.2-mm)][0.0598-inch (1.5-mm)][0.0747-inch**

(1.9-mm)]<Insert dimension> minimum nominal thickness for uncoated steel.

- K. Panel Closure: Manufacturer's standard fire-rated closure unless otherwise indicated.
 - 1. Initial Closure: **[Resilient, bulb-shaped acoustical seal][Fixed jamb][As indicated]<Insert description>**.
 - 2. Final Closure: Fire-rated, **[constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal][hinged jamb closure][hinged communicating panel][fixed jamb][angle jamb][resilient, bulb-shaped acoustical seal]<Insert description>**.
- L. Hardware: Manufacturer's standard as required to operate fire-rated operable panel partition and accessories; with decorative, protective finish.
 - 1. Hinges: **[Manufacturer's standard]<Insert type>**.
 - 2. **<Insert hardware requirement>**.
- M. Finish Facing: **[Owner furnished][Vinyl-coated fabric wall covering][Carpet wall covering][Fabric wall covering][High-pressure decorative laminate][Wood veneer][Paint]<Insert finish>**.

2.4 SEALS

- A. Description: Seals that produce operable panel partitions complying with performance requirements and the following:
 - 1. Manufacturer's standard seals unless otherwise indicated.
 - 2. Seals made from materials and in profiles that minimize sound leakage.
 - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Vertical Seals: Deep-nesting, interlocking **[steel]** astragals mounted on each edge of panel, with continuous, resilient acoustical seal.
- C. Horizontal Top Seals: **[Continuous-contact, resilient seal exerting uniform constant pressure on track][or][resilient, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on track when extended]**.
- D. Horizontal Bottom Seals:
 - 1. Manufacturer's standard continuous-contact seal exerting uniform constant pressure on floor.
 - 2. Resilient, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 - a. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than **[1-1/2 inches (38 mm)][2 inches (50 mm)][4 inches (102 mm)][6 inches (152 mm)]** between retracted seal and floor finish.
 - b. Mechanically Operated for Fire-Rated Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than **[1-1/2 inches (38 mm)][2 inches (50 mm)][4 inches (102 mm)]** between retracted seal and floor finish.
 - c. Automatically Operated for Acoustical Panels: Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less than **[1 inch (25 mm)][1-1/2 inches (38 mm)][2 inches (50 mm)]** between retracted seal and floor

finish.

2.5 PANEL FINISH FACINGS

- A. Description: Finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
1. Apply **[one-piece, seamless]** facings free of air bubbles, wrinkles, blisters, and other defects, **[with edges tightly butted, and][with invisible seams complying with Shop Drawings for location, and]** with no gaps or overlaps. Horizontal **[butted edges][seams]** are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 2. Where facings with **[directional or repeating patterns or directional weave][directional, repeating, or matching grain]** are indicated, mark facing top and attach facing in same direction.
 3. Match facing pattern **72 inches (1830 mm)** above finished floor.
- B. Owner-Furnished Facing Material: **<Insert requirements>**.
- C. Vinyl-Coated Fabric Wall Covering: Manufacturer's standard, mildew-resistant, washable, vinyl-coated fabric wall covering; complying with WA-101, **[Type I-Light Duty][Type II-Medium Duty][Type III-Heavy Duty]**; Class A.
1. Total Weight: **<Insert value>**.
 2. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.
 3. Color/Pattern: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color/pattern>**.
- D. Carpet Wall Covering: Manufacturer's standard **[nonwoven, needle-punched carpet with fibers fused to backing]**, from same dye lot, treated to resist stains.
1. Color/Pattern: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color/pattern>**.
- E. Fabric Wall Covering: **[Manufacturer's standard fabric][100 percent polyolefin woven fabric]<Insert fabric description>**, from same dye lot, treated to resist stains.
1. Color/Pattern: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color/pattern>**.
- F. High-Pressure Decorative Laminate: ISO 4586-3, Horizontal grade.
1. Color/Pattern: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color/pattern>**.
- G. Wood Veneer: Laminated to **[noncombustible][fire-retardant-treated wood]** core with moisture-resistant adhesive.
1. Species and Cut: **[Maple, plain sliced][Poplar, plain sliced][White oak, rift cut][White ash, plain sliced][As indicated][As selected by Architect from manufacturer's full range]<Insert species and cut>**.
 2. Matching of Adjacent Veneer Leaves: **[Book][Slip][Random]** match.
 3. Veneer Matching within Panel Face: **[Running][Balance][Center-balance]** match.
 4. Panel-Matching Method: **[No matching between panels is required. Select and arrange panels for similarity of grain pattern and color between adjacent panels]<Insert**

requirement>.

5. Vertical Panel-Matching Method: [Continuous match; veneer leaves of upper panels are continuations of veneer leaves of lower panels][Vertical book match; veneer leaves are individually book matched from lower panels to upper panels][Vertical slip match; veneer leaves are individually slip matched from lower panels to upper panels][Panel vertical book match; panels are book matched from lower panels to upper panels][Panel vertical slip match; panels are slip matched from lower panels to upper panels].
6. Wood-Veneer Finish:
 - a. [As specified in Section 099300 "Staining and Transparent Finishing."]<Insert description.>
 - b. [Match Architect's sample][As selected by Architect from manufacturer's full range], as follows:
 - 1) Type: [Transparent finish][Transparent finish over stain]<Insert finish> over wood variety indicated.
- H. Paint: Manufacturer's standard [factory-][field-]painted finish.
 1. Color: [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- I. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:
 1. Steel, Painted: Finished with manufacturer's [standard neutral color][color matching Architect's sample][color as selected by Architect from manufacturer's full range].
 2. Aluminum: Finished with manufacturer's standard [mill][clear anodic][color anodic] finish.
- J. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

2.6 SUSPENSION SYSTEMS

- A. Tracks: Steel or aluminum [mounted directly to overhead structural support,][with adjustable steel hanger rods for overhead support,] designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than **0.10 inch (2.54 mm)** between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 1. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
 2. Head Closure Trim: As required for acoustical performance; [with factory-applied, decorative, protective finish][primed for field finish].
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
 1. Multidirectional Carriers: Capable of negotiating intersections without track switches.
- C. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.

1. Curve-and-Diverter Switches: Allow radius turns to divert panels to an auxiliary track.
2. L Intersections: Allow panels to change 90 degrees in direction of travel.
3. T Intersections: Allow panels to pass through or change 90 degrees to another direction of travel.
4. X Intersections: Allow panels to pass through or change travel direction full circle in 90-degree increments, and allow one partition to cross track of another.
5. Multidirectional Switches: Adjustable switch configuring track into L, T, or X intersections and allowing panels to be moved in all pass-through, 90-degree change, and cross-over travel direction combinations.
6. Center carrier stop.

- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
- E. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.7 ELECTRIC OPERATORS

- A. Factory-assembled electric operation system of size and capacity recommended and provided by operable panel partition manufacturer for partition specified; with electric motor and factory-prewired motor controls, speed reducer, chain drive, control stations, control devices, and accessories required for operation. Include wiring from control stations to motor. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
- B. Comply with NFPA 70.
- C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.
- D. Motor Electrical Characteristics:
 1. Horsepower: **[Manufacturer's standard]<Insert value>**.
 2. Volts: **[115][208][230][460]<Insert value>**.
 3. Phase: **[Single phase][Polyphase]**.
 4. Hertz: 60.
- E. Control Stations: Two single-key-operated, constant-pressure control stations located remotely from each other on opposite sides and opposite ends of partition run. Wire in series to require simultaneous activation of both key stations to operate partition. Each three-position control station labeled "Open," "Close," and "**[Off][Stop]**." Furnish two keys per station.
- F. Obstruction-Detection Devices: Equip each motorized operable panel partition with indicated automatic safety sensor that causes operator to immediately **[shut off motor][stop and reverse direction]**.
 1. Sensor Edge: Contact-pressure-sensitive safety edge along partition's leading edge.
 2. Sensor Mat: Electrically operated, contact-weight-sensitive safety mat in storage pocket area.
 3. Infrared Sensor System: Designed to detect an obstruction in partition's path and sound an audible alarm, without obstruction contacting partition.
- G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop operable panel partition at fully extended and fully stacked positions.
- H. Emergency Release Mechanism: Quick disconnect-release of electric-motor drive system, permitting manual operation in event of operating failure.

- I. Electric Interlock: Equip each motorized operable panel partition with electric interlocks at locations indicated, to prevent operation of operable panel partition under the following conditions:
 1. On storage pocket door, to prevent operation if door is not in fully open position.
 2. On partitions at location of convergence by another partition, to prevent operation if merging partitions are in place.

2.8 ACCESSORIES

- A. Pass Doors: Swinging door built into and matching panel **[materials,][construction,][acoustical qualities,][fire rating,]** finish and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.
 1. Accessibility Standard: Fabricate doors to comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and][ICC A117.1]<Insert requirement>.**
 2. Single Pass Door: **[36 by 80 inches (914 by 2032 mm)]****[36 by 84 inches (914 by 2134 mm)]<Insert dimensions>.**
 3. Double Pass Door: **[72 by 80 inches (1829 by 2032 mm)]****[72 by 84 inches (1829 by 2134 mm)]<Insert dimensions>.**
 4. Pass-Door Hardware: Equip pass door with the following:
 - a. Door Seals: **[Mechanically operated floor seal on panels containing pass doors]****[Sweep floor seals].**
 - b. **[Panic]****[Fire exit]** hardware.
 - c. Concealed door closer.
 - d. Door Viewer: Installed with view in direction of swing.
 - e. Exit Sign: Recessed, self-illuminated.
 - f. Latchset: Passage set.
 - g. Lock, Key Operated: Key-operated lock with cylinder**[, keyed to master key system,]** operable from both sides of door. Include two keys per lock.
 - h. Lock, Deadlock: Deadlock to receive cylinder, operable from both sides of door. See **[Section 087100 "Door Hardware"]****[Section 087111 "Door Hardware (Descriptive Specification)"]** for lock cylinder and keying requirements.
- B. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware**and acoustical seals at soffit, floor, and jambs**. Hinges in finish to match other exposed hardware.
 1. Manufacturer's standard method to secure storage pocket door in closed position.
 2. Rim Lock, Key Operated: Key-operated lock cylinder**[, keyed to master key system,]** to secure storage pocket door in closed position. Include two keys per lock.
 3. Rim Lock, Deadlock: Deadlock to receive cylinder, to secure storage pocket door in closed position. See **[Section 087100 "Door Hardware"]****[Section 087111 "Door Hardware (Descriptive Specification)"]** for lock cylinder and keying requirements.
- C. Windows: **[Manufacturer's standard]****[As indicated]<Insert requirement>.**
 1. Glass: Safety glass **[matching Architect's sample]****[as selected by Architect from manufacturer's full range]<Insert requirement>.**
 2. Safety Glass Standard for Partition Panels: Glass products complying with testing requirements in 16 CFR 1201, Category II, or in ANSI Z97.1, Class A.
 3. Safety Glass Standard for Pass Doors: Glass products complying with testing requirements in 16 CFR 1201, Category II.

- D. Work Surfaces: Quantities, placement, and size indicated.
1. Surface: **[Porcelain steel marker/projection surface][Self-healing, tackable, vinyl-coated fabric wall covering, complying with WA-101, Type II-Medium Duty; Class A; laminated to natural cork tackboard]<Insert description>.**
 2. Surface Color: **[Matching Architect's sample][As selected by Architect from manufacturer's full range]<Insert manufacturer's designation for color>.**
 3. Size: **[Full width and height of panel][Full width of panel by 48 inches (1219 mm)][48 by 48 inches (1219 by 1219 mm)][As indicated on Drawings]<Insert dimensions>.**
 4. Trim: **[Aluminum slip-on or snap-on trim with no visible screws or exposed joints and with corners mitered to a neat, hairline joint]<Insert description>.**
- E. Chalk Tray and Eraser Pocket: Aluminum with **[mill][clear anodic][color anodic]** finish.
- F. Chair Rails: **<Insert material, finish, dimensions, and other characteristics not indicated on Drawings>.** **[Recessed][Surface mounted]** in locations indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF OPERABLE PANEL PARTITIONS

- A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- B. Install panels in numbered sequence indicated on Shop Drawings.
- C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
- E. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals. **[Perform test and make adjustments before NIC testing.]**

3.3 FIELD QUALITY CONTROL

- A. NIC Testing: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
1. Testing Extent: Testing agency is to randomly select **[one]<Insert number>** operable panel partition installation(s) for testing.
 2. Testing Methodology: Perform testing of installed operable panel partition for noise isolation in

accordance with ASTM E336, determined by ASTM E413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.

- B. An operable panel partition installation will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust **[pass doors][and][storage pocket doors]** to operate smoothly and easily, without binding or warping.
- C. Verify that safety devices are properly functioning.

3.5 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service is to include **[three][six][nine][12]** months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

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SECTION 10 22 00 00A - ALL-GLASS PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed all-glass partitions.
2. Manual-folding all-glass partition systems.
3. Manual-sliding all-glass partition systems.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for overhead-steel support for all-glass partitions.
2. Section 084126.23 "Interior All-Glass Entrances" for interior, manual-swinging and manual-sliding all-glass doors used as pass doors in all-glass partitions.
3. Section 102239.13 "Folding-Glass-Panel Partitions" for manual-folding and manual-sliding, framed, glass panel partition systems.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics and furnished accessories.
3. **<Insert requirements>**.

B. Shop Drawings:

1. Plans, elevations, sections, **[numbered panel installation sequence,]** and attachment details.
2. Dimensions, configuration of glass panels. **[Include stacking layout, operating clearances, and direction of travel.]**
3. Location and installation requirements for hardware and overhead support.
4. **<Insert requirements>**.
5. Signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of fitting, accessory fitting, glass, and hardware.

- D. Samples for Verification: Actual sample of finished products for each type of fitting, accessory fitting, glass; showing exposed edge finish, and hardware.

1. Size: **[Manufacturers' standard size]<Insert size>**.

E. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): For each product.
2. Health Product Declaration (HPD): For each product.
3. Environmental Product Declaration (EPD): For each product.
4. Health Product Declaration (HPD): For each product.
5. Environmental Product Declaration (EPD): For each product.
6. Environmental Product Declaration (EPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Third-Party Certifications: For each product.
9. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For heat-soak testing of fully tempered glass.
- B. Field Quality-Control Reports: For egress door inspections for pivoting swing panels used as a means of egress.
- C. Qualification Statements: For Installer[**and egress door inspector**].
- D. Delegated Design Submittals: For seismic restraint of all-glass partitions, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Delegated design engineer qualifications.
- F. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For all-glass partitions.
1. Furnish a complete set of specialized tools and maintenance instructions as required for Owner's continued adjustment and maintenance of [**manual-folding**][**manual-sliding**] all-glass partitions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Fabricator of products.
 2. Entity that employs installers and supervisors who are trained and approved by manufacturer.
 3. Authorized representative who is trained and approved by manufacturer.
 4. Entity that is certified under the North American Contractor Certification Program (NACC) and that employs installers and supervisors who are trained and approved by manufacturer[**and who are certified under the Architectural Glass and Metal Technician (AGMT) certification program**].
- B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in [**state**]**<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.

C. Egress Door Inspector Qualifications:

1. Inspector for field quality-control inspections of egress door assemblies to comply with qualifications set forth in NFPA 101, Ch. 7 "Means of Egress," Section "Means of Egress Components," Article "Inspection of Door Openings."
2. Inspector for field quality-control inspections of egress door assemblies to be certified under DHI's certification program as a Fire and Egress Door Assembly Inspector (FDAI) or a Certified Fire and Egress Door Assembly Inspector (CFDAI).

1.7 MOCKUPS

- A. Build mockups **[to verify selections made under Sample submittals][to demonstrate aesthetic effects][to set quality standards for materials and execution][to set quality standards for fabrication and installation]**.
1. Build mockup **[as indicated on Drawings]<Insert mockup requirements>**.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with all-glass partitions by field measurements; coordinate prior to fabrication.

1.10 WARRANTY

- A. Special Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace components of all-glass partitions that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures, including **<Insert type of failure>**.
 - b. Faulty operation of **<Insert components>**.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - d. **<Insert conditions relating to specified products>**.
 - e. **<Insert failure modes>**.
 2. Warranty Period: **[Two][Five][10]<Insert number>** years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge



separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: **[Five][10]<Insert number>** years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

1. Warranty Period: **[Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain all components of all-glass partitions[**and doors within all-glass partitions**], including fittings, hardware, and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraint of all-glass partition systems.

B. Seismic Performance: All-glass partitions to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.

C. Deflection Limits, Interior Glazed Areas: Differential deflection of two adjacent unsupported glass panel edges is not to exceed thickness of panels when a force of **50 plf (0.73 kN)** is applied horizontally to one panel at any point up to **42 inches (1067 mm)** above finished floor.

D. Accessibility Standards: Comply with applicable provisions in **[the DOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]<Insert accessibility standard>** for **[pivoting swing][or][sliding]** glass panels designated as accessible.

2.3 FIXED ALL-GLASS PARTITIONS

A. Fixed All-Glass Partition : Interior partitions composed of single-glazed frameless glass panels and fittings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Avanti Systems USA]**
- b. **[C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
- c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Avanti Systems USA]**
- b. **[C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
- c. **<Insert manufacturer's name>**

B. Glass Panels:

1. Width: **[Manufacturer's standard panel width to form an assembled system of dimensions indicated on Drawings and verified by field measurements][Equal width panels to form an assembled system of dimensions indicated on Drawings and verified by field measurements; widths not to exceed manufacturer's maximum][As indicated on Drawings]<Insert width>**.
2. Height: **[Manufacturer's standard][As indicated on Drawings]<Insert height>**.
3. Glass Type:
 - a. Monolithic Glass: **[Fully tempered float glass; clear][Fully tempered float glass; low iron][Fully tempered patterned glass]<Insert description>**.
 - 1) Glass Thickness: **[10][12][16][19]** mm.
 - b. Laminated Glass: **[Annealed float glass; clear][Annealed float glass; low iron][Patterned glass]<Insert description>**.
 - 1) Glass Ply Thickness: **[5][6][8]<Insert thickness>** mm each.
 - 2) Interlayer Material: **[Polyvinyl butyral][Ionoplast][Manufacturer's standard]**.
 - 3) Interlayer Thickness: **[0.030 inch (0.76 mm)][0.060 inch (1.52 mm)][0.090 inch (2.3 mm)]<Insert thickness>**.
 - 4) Interlayer Type: **[Clear][Colored][Patterned][Graphic]<Insert requirement>**.
4. Manufacturer's standard factory-glazing system, single-glazed.

C. Fitting Configuration: **[Recessed glazing channel at top and continuous rail fitting at bottom][Recessed glazing channel at top and bottom][Continuous rail fitting at top and bottom]<Insert fitting configuration>**.

D. Rail Fittings:

1. Top Rail Height: **[4 inches (102 mm)][As indicated]<Insert dimension>**.
2. Bottom Rail Height: **[4 inches (102 mm)][As indicated]<Insert dimension>**.
3. Profile: **[Tapered][Tapered flat][Square][Curved][As indicated]<Insert profile>**.
4. End Caps: Manufacturer's standard precision-fit end caps finished to match rail. **[Miter endcaps at corner panels.]**

E. Accessory Fittings:

1. U-channel.
2. **<Insert requirements>**.

F. Fitting Material: **[Clear-anodized aluminum][Color-anodized aluminum][Powder-coated aluminum][Bronze-clad aluminum][Brass-clad aluminum][Stainless steel-clad aluminum]**.

G. Anchors and Fastenings: Concealed.

2.4 MANUAL-FOLDING ALL-GLASS PARTITION SYSTEMS

- A. Manual-Folding All-Glass Partition System : Interior partition systems composed of single-glazed frameless glass panels, fittings, and hardware.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hufcor, Inc]**
 - b. **[Modernfold, Inc]**
 - c. **[Nana Wall Systems, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hufcor, Inc]**
 - b. **[Modernfold, Inc]**
 - c. **[Nana Wall Systems, Inc.]**
 - d. **<Insert manufacturer's name>**
 3. Operation: Manually operated, top-hung, **[center pivot,][continuously hinged][paired][continuously hinged and paired]** folding glass panels **[with end single-action pivoting swing panel][with end double-action pivoting swing panel][with lead single-action folding pivoting swing panel]**.
 4. Partition/Track Configuration: As indicated on Drawings.
 5. Stacking Configuration: **[Center stacking][Perpendicular inward stacking][Perpendicular outward stacking][As indicated on Drawings]**.
- B. Glass Panels:
1. Width: **[Manufacturer's standard panel width to form an assembled system of dimensions indicated on Drawings and verified by field measurements][Equal width panels to form an assembled system of dimensions indicated on Drawings and verified by field measurements; widths not to exceed manufacturer's maximum][As indicated on Drawings]<Insert width>.[Width to not be less than 32 inches (813 mm) clear.]**
 2. Height: **[Manufacturer's standard][As indicated on Drawings]<Insert height>.[Height to not be less than 80 inches (2032 mm).]**
 3. Weight: **[7 lb/sq. ft. (34 kg/sq. m)]<Insert value> maximum.**
 4. Glass Type:
 - a. Monolithic Glass: **[Fully tempered float glass; clear][Fully tempered float glass; low iron]<Insert description>.**
 - 1) Glass Thickness: **[10][12] mm <Insert thickness>.**
 - b. Laminated Glass: **[Annealed float glass; clear][Annealed float glass; low iron][Fully tempered float glass; clear][Fully tempered float glass; low iron]<Insert description>.**
 - 1) Glass Ply Thickness: **[5][6]<Insert thickness> mm each.**
 - 2) Interlayer Material: **[Polyvinyl butyral][Ionoplast][Manufacturer's standard].**
 - 3) Interlayer Thickness: **[0.030 inch (0.76 mm)][0.060 inch (1.52 mm)][0.090 inch**

- (2.3 mm)]<Insert thickness>.
- 4) Interlayer Type: [Clear][Colored][Patterned][Graphic]<Insert requirement>.
5. Manufacturer's standard factory-glazing system; single glazed.
- C. Rail Fittings: Continuous interlocking rail fittings at top and bottom of glass panels.
1. Top Rail Height: [4 inches (102 mm)][As indicated on Drawings]<Insert dimension>.
 2. Bottom Rail Height: [4 inches (102 mm)][10 inches (255 mm)][As indicated on Drawings]<Insert dimension>.
 3. Top and Bottom Rail Depth: [1-7/16 inches (36 mm)][As indicated on Drawings]<Insert dimension>.
 4. Profile: [Square][Tapered at 60 degrees minimum from the horizontal][As indicated on Drawings]<Insert profile>.
 5. End Caps: Manufacturer's standard precision-fit end caps finished to match rail. [Miter endcaps at corner panels.]
 6. Fitting Material: [Clear-anodized aluminum][Color-anodized aluminum][Powder-coated aluminum][Bronze-clad aluminum][Brass-clad aluminum][Stainless steel-clad aluminum].
- D. Hardware:
1. Provide manufacturer's standard hardware designed to smoothly operate, tightly close, and securely lock manual-folding all-glass partition system in place. Size hardware to accommodate panel weights and dimensions. For exposed parts, match metal and finish of fittings.
 2. Glass Panel Hardware:
 - a. Hinges: [Manufacturer's standard][Concealed (invisible)] hinges attached to top and bottom rail.
 - b. Floor Bolt: Manufacturer's standard floor bolt and floor-mounted receiver at each panel.
 - c. Partition System Lock: [Thumb-turn][Key-actuated] floor bolt and floor strike at lead panel.
 3. Pivoting Swing Panel Hardware:
 - a. Panic hardware.
 - b. Lock: [Thumb-turn][Key-actuated] floor bolt and floor strike.
 - c. Closer: [Overhead][Floor].
 - d. Door Pulls Back-to-Back: [Tubular pull][Ladder pull][Locking ladder pull][Finger pull rosette][Push/pull knob]<Insert description>.
 4. Suspension System: Provide panel suspension system designed for size, weight, and performance requirements of manual-folding all-glass partition systems indicated.
 - a. Overhead Track: Extruded aluminum [mounted directly to overhead structural support][with adjustable steel hanger rods for overhead support]. Size track to support partition operation and stacking without damage to suspension system, glass panels, or adjacent construction. Limit track deflection to no more than [0.10 inch (2.54 mm)]<Insert dimension> between supports when fully loaded. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated.
 - 1) Aluminum Finish: [Clear anodized][Color anodized][Powder coated][Manufacturer's standard factory-applied finish].
 - b. Carriers: Manufacturer's standard multi-wheeled carriers with sealed ball bearings.
 - c. Floor Track: Manufacturer's standard recessed floor guide track. Finish to match overhead

- track.
- d. Center carrier stop.

E. Accessories:

1. Glass Edge Protection: Manufacturer's standard **[transparent gasket][thin aluminum astragal trim]** to protect vertical edge of glass.
2. Head Closure Trim: **[Finish to match fittings][Primed for field finish]**.
3. **[Single][Double]** top and bottom brush seals.
4. **<Insert description>**.

F. Anchors and Fastenings: Concealed.

2.5 MANUAL-SLIDING ALL-GLASS PARTITION SYSTEMS

A. Manual-Sliding All-Glass Partition System : Interior partition systems composed of single-glazed frameless glass panels, fittings, and hardware.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Avanti Systems USA]**
 - b. **[dormakaba USA Inc.]**
 - c. **[Hufcor, Inc]**
 - d. **[KWIK-WALL Company]**
 - e. **[Moderco Inc]**
 - f. **[Modernfold, Inc]**
 - g. **[Nana Wall Systems, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Avanti Systems USA]**
 - b. **[dormakaba USA Inc.]**
 - c. **[Hufcor, Inc]**
 - d. **[KWIK-WALL Company]**
 - e. **[Moderco Inc]**
 - f. **[Modernfold, Inc]**
 - g. **[Nana Wall Systems, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Operation: Manually operated, top-hung, **[center pivot,]** individual sliding glass panels on single track **[with end single-action pivoting swing panel][with end double-action pivoting swing panel][with single-action pivoting swing panel in location(s) indicated on Drawings][with double-action pivoting swing panel in location(s) indicated on Drawings]**.
4. Partition/Track Configuration: As indicated on Drawings.
5. Stacking Configuration: **[Center stacking][Offset parallel stacking][Offset perpendicular stacking][As indicated on Drawings]**.

B. Glass Panels:

1. Width: **[Manufacturer's standard panel width to form an assembled system of dimensions indicated on Drawings and verified by field measurements][Equal width panels to form an assembled system of dimensions indicated on Drawings and verified by field measurements; widths not to exceed manufacturer's maximum][As indicated on Drawings]<Insert width>.** Width to not be less than **32 inches (813 mm)** clear.]
 2. Height: **[Manufacturer's standard][As indicated on Drawings]<Insert height>.** Height to not be less than **80 inches (2032 mm).**]
 3. Weight: **[7 lb/sq. ft. (34 kg/sq. m)]<Insert value>** maximum.
 4. Glass Type:
 - a. Monolithic Glass: **[Fully tempered float glass; clear][Fully tempered float glass; low iron]<Insert description>.**
 - 1) Glass Thickness: **[10][12]** mm **<Insert thickness>.**
 - b. Laminated Glass: **[Annealed float glass; clear][Annealed float glass; low iron][Fully tempered float glass; clear][Fully tempered float glass; low iron]<Insert description>.**
 - 1) Glass Ply Thickness: **[5][6]<Insert thickness>** mm each.
 - 2) Interlayer Material: **[Polyvinyl butyral][Ionoplast][Manufacturer's standard].**
 - 3) Interlayer Thickness: **[0.030 inch (0.76 mm)][0.060 inch (1.52 mm)][0.090 inch (2.3 mm)]<Insert thickness>.**
 - 4) Interlayer Type: **[Clear][Colored][Patterned][Graphic]<Insert requirement>.**
 5. Manufacturer's standard factory-glazing system; single glazed.
- C. Rail Fittings: Continuous interlocking rail fittings at top and bottom of glass panels.
1. Top Rail Height: **[4 inches (102 mm)][As indicated on Drawings]<Insert dimension>.**
 2. Bottom Rail Height: **[4 inches (102 mm)][10 inches (255 mm)][As indicated on Drawings]<Insert dimension>.**
 3. Top and Bottom Rail Depth: **[1-7/16 inches (36 mm)][As indicated on Drawings]<Insert dimension>.**
 4. Profile: **[Square][Tapered at 60 degrees minimum from the horizontal][As indicated on Drawings]<Insert profile>.**
 5. End Caps: Manufacturer's standard precision-fit end caps finished to match rail.**[Miter endcaps at corner panels.]**
 6. Fitting Material: **[Clear-anodized aluminum][Color-anodized aluminum][Powder-coated aluminum][Bronze-clad aluminum][Brass-clad aluminum][Stainless steel-clad aluminum].**
- D. Hardware:
1. Provide manufacturer's standard hardware designed to smoothly operate, tightly close, and securely lock manual-sliding all-glass partition system in place. Size hardware to accommodate panel weights and dimensions. For exposed parts, match metal and finish of fittings.
 2. Glass Panel Hardware:
 - a. Floor Bolt: Manufacturer's standard floor bolt and floor-mounted receiver at each panel.
 - b. Partition System Lock: **[Thumb-turn][Key-actuated]** floor bolt and floor strike at lead panel.
 3. Pivoting Swing Panel Hardware:
 - a. Panic hardware.
 - b. Lock: **[Thumb-turn][Key-actuated]** floor bolt and floor strike.
 - c. Closer: **[Overhead][Floor].**



- d. Door Pulls Back-to-Back: **[Tubular pull][Ladder pull][Locking ladder pull][Finger pull rosette][Push/pull knob]<Insert description>**.
- 4. Suspension System: Provide panel suspension system designed for size, weight, and performance requirements of manual-sliding all-glass partition systems indicated.
 - a. Overhead Track: Extruded aluminum **[mounted directly to overhead structural support][with adjustable steel hanger rods for overhead support]**. Size track to support partition operation and stacking without damage to suspension system, glass panels, or adjacent construction. Limit track deflection to no more than **[0.10 inch (2.54 mm)]<Insert dimension>** between supports when fully loaded. Provide a continuous system of track sections and accessories to accommodate partition configuration and layout indicated. Provide intersections, switches, and accessories required for stacking configuration indicated.
 - 1) Aluminum Finish: **[Clear anodized][Color anodized][Powder coated][Manufacturer's standard factory-applied finish]**.
 - b. Carriers: Manufacturer's standard multi-wheeled counter-rotating carriers with sealed ball bearings.
 - c. Floor Track: Manufacturer's standard recessed floor guide track. Finish to match overhead track.
 - d. Center carrier stop.
- E. Accessories:
 - 1. Glass Edge Protection: Manufacturer's standard **[transparent gasket][thin aluminum astragal trim]** to protect vertical edge of glass.
 - 2. Head Closure Trim: **[Finish to match fittings][Primed for field finish]**.
 - 3. **[Single][Double]** top and bottom brush seals.
 - 4. **<Insert description>**.
- F. Anchors and Fastenings: Concealed.

2.6 GLASS

- A. Glass: As specified in Section 088000 "Glazing."
- B. Glass as Follows:
 - 1. Safety Glass:
 - a. Glass Panels: Safety glass complying with testing requirements in 16 CFR 1201, Category II, or ANSI Z97.1.
 - b. Pivoting Swing Panels: Safety glass complying with testing requirements in 16 CFR 1201, Category II.
 - c. Safety-Glass Labeling: Permanently mark each pane of safety glass with certification label of **[the SGCC][the SGCC or another certification agency acceptable to authorities having jurisdiction][or][manufacturer]**. Label must indicate manufacturer or Installer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 - 2. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I (transparent flat glass), Class 1 (clear and low iron), Quality-Q3. **[Fully tempered glass to be heat-soak tested in accordance with BS EN 14179-1.]**

3. Fully Tempered Patterned Glass: ASTM C1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified. [**Fully tempered glass to be heat-soak tested in accordance with BS EN 14179-1.**]
 4. Laminated Glass: ASTM C1172 [**Type I**][**Type 2**] with two plies of glass bonded together by an interlayer.
 - a. Annealed Float Glass: ASTM C1036, Type I (transparent flat glass), Class 1 (clear and low iron), Quality-Q3.
 - b. Patterned Glass: ASTM C1036, Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.
 - c. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I (transparent flat glass), Class 1 (clear and low iron), Quality-Q3.
 5. Exposed Edges: Machine ground and flat polished.
 6. Butt Edges: Flat ground.
 7. Corner Edges: Lap-joint corners with exposed edges polished.
- C. Distraction Markings: All-glass doors and adjacent all-glass panels to have [**factory-**][**field-**] applied markings located [**between 30 and 36 inches (762 and 914 mm)**] <Insert height> above finished floor and located [**between 60 and 66 inches (1524 and 1675 mm)**] <Insert height> above finished floor.
1. Marking Design: [**As indicated on Drawings**] <Insert description>.
 2. Marking Dimensions: [**As indicated on Drawings**] <Insert requirements>.
 3. Marking Method: [**Chemical etching**][**Sandblasting**][**Adhesive strips**][**Decals**][**Gilding**] <Insert method>.

2.7 MATERIALS

- A. Aluminum: **ASTM B221 (ASTM B221M)**, with strength and durability characteristics of not less than Alloy 6063-T5 for extruded bars, rods, profiles, and tubes. ASTM B209/B209M for sheet and plat.
1. Clear-Anodized Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**][**AA-M12C22A31, Class II, 0.010 mm**] or thicker.
 2. Color-Anodized Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**][**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.
 - a. Color: [**Light bronze**][**Medium bronze**][**Dark bronze**][**Black**][**Match Architect's sample**][**As selected by Architect from full range of industry colors and color densities**] <Insert color>.
 3. Powder-Coated Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - a. Color and Gloss: [**As indicated by manufacturer's designations**][**Match Architect's sample**][**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
 4. Bronze Cladding: ASTM B36/B36M, alloy [**as standard with manufacturer**] <Insert requirements>.
 - a. Finish: [**Polished M21-O6x**][**Satin M31-M34-O6x**][**Statuary M31-C5**][**Match Architect's sample**][**As selected by Architect from full range of industry finishes**] <Insert finish>.



5. Brass Cladding: ASTM B36/B36M, alloy [as standard with manufacturer]<Insert requirements>.

a. Finish: [Polished M21-O6x][Satin M31-M34-O6x][As selected by Architect from full range of industry finishes]<Insert finish>.

6. Stainless Steel Cladding: ASTM A240/A240M or ASTM A666, Type 304.

a. Finish: [Directional Satin Finish: ASTM A480/480M, No. 4][Mirror Finish: ASTM A480/480M, No. 8]<Insert finish>.

B. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M or ASTM A666, austenitic stainless steel, Type 304.

1. Finish: [ASTM A480/480M No. 4 directional satin finish][ASTM A480/480M No. 6 dull satin finish][ASTM A480/480M No. 7 reflective, directional finish]<Insert finish>.

C. Stainless Steel Tubing: ASTM A240/A240M or ASTM A666, austenitic stainless steel, Type 304.

1. Finish: [180-Grit Polished Finish: Uniform, directionally textured finish][280-Grit Polished Finish: Fine finish][Polished and Buffed Finish: 320-grit finish followed by buffing]<Insert finish>.

a. Polished and Buffed Finish: Buff to [high luster finish][mirrorlike finish][match Architect's sample].

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

1. Finish: [ASTM A480/480M No. 4 directional satin finish][ASTM A480/480M No. 6 dull satin finish][ASTM A480/480M No. 7 reflective, directional finish]<Insert finish>.

2.8 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or glass panel.

B. Complete fabrication, assembly, finishing, fitting and hardware application, and other work in the factory to greatest extent possible.

C. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight hairline joints and uniform appearance, and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Factory-Glazed Fabrication: Glaze all-glass partitions in the factory. Comply with manufacturer's written instructions and with requirements in Section 088000 "Glazing."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of floor, and operational clearances.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install all-glass partitions and associated components in accordance with Drawings, approved Shop Drawings, and manufacturer's written instructions.
- B. Install panels in numbered sequence indicated on approved Shop Drawings.
- C. Set units level, plumb, and true to line, with uniform joints.
- D. Maintain uniform clearances between adjacent components.
- E. Lubricate hardware and other moving parts in accordance with manufacturer's written instructions.
- F. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: **[Owner will engage][Engage]** a qualified inspector to perform inspections.
- B. Inspections:
 - 1. Egress Door Inspections: Inspect each pivoting swing panel equipped with panic hardware or located in an exit enclosure, in accordance with NFPA 101, Ch. 7 "Means of Egress," Section "Means of Egress Components," Article "Inspection of Door Openings."
 - 2. Pivoting swing panels will be considered defective if they do not pass inspections.
- C. Prepare inspection reports.

3.4 ADJUSTING

- A. Adjust operable all-glass partitions and hardware to function smoothly.

3.5 MAINTENANCE SERVICE

- A. Beginning at Substantial Completion, maintenance service to include **[three][six][nine][12]** months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies to be manufacturer's authorized



10 - Specialties

replacement parts and supplies.

3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain operable all-glass partitions.

END OF SECTION 10 22 00 00A

SECTION 10 22 13 00 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-duty wire mesh partitions.
2. Heavy-duty wire mesh partitions.
3. Wire mesh ceilings.
4. Wire mesh stairway partitions.
5. Wire mesh equipment barriers.

1.2 DEFINITIONS

- A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.
- B. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in place.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Wire mesh **[partitions][ceilings][stairway partitions][and][equipment barriers]**.
2. **<Insert products>**.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Indicate clearances required for operation of **[service windows][doors][and][gates]**.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for units with factory-applied color finishes.

D. Samples for Verification: Panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.

1. Size: **12 by 12 inches (300 by 300 mm)**.

E. Delegated Design Submittals: For wire mesh partitions indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.



1.4 INFORMATIONAL SUBMITTALS

- A. Certificates:
 - 1. Welding certificates.
- B. Qualification Statements: For Installer.
- C. Delegated design engineer qualifications.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wire mesh partition hardware.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Locks: Furnish **[5]<Insert number>** percent of quantity installed for each type indicated, but no fewer than **<Insert number>** locks.

1.7 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installers: **[Fabricator of products][Entity that employs installers and supervisors who are trained and approved by manufacturer][Authorized representative who is trained and approved by manufacturer]**.
 - 2. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
 - a. AWS D1.1/D1.1M.
 - b. AWS D1.3/D1.3M.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh items **[with cardboard protectors on perimeters of panels and doors and with posts wrapped][palletted][crated]** to provide protection during transit and Project-site storage. Use vented plastic.
- B. Inventory wire mesh partition door hardware on receipt, and provide secure lockup for wire mesh partition door hardware delivered to Project site.
 - 1. Tag each item or package separately with identification, and include basic installation instructions with each item or package.
- C. Deliver keys to Owner by registered mail or overnight package service[.], **addressed as follows:**
 - 1. **<Insert name and address of Owner's representative>**.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 WIRE MESH PARTITIONS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Acorn Wire & Iron Works]**
2. **[American Wire Corporation]**
3. **[California Wire Products Corporation]**
4. **[Central Wire & Iron Works, LLC]**
5. **[Folding Guard, Incorporated]**
6. **[G-S Company (The)]**
7. **[Indiana Wire Products, Inc]**
8. **[Jesco Industries, Inc.]**
9. **[Kenco Wire & Iron Products Inc.]**
10. **[King Wire Partitions, Inc]**
11. **[Miller Wire Works, Inc]**
12. **[Newark Wire Works Inc]**
13. **[R. J. Donaldson, Inc.]**
14. **[SpaceGuard Products]**
15. **[Standard Wire & Steel Works]**
16. **[WireCrafters, LLC]**
17. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Acorn Wire & Iron Works]**
2. **[American Wire Corporation]**
3. **[California Wire Products Corporation]**
4. **[Central Wire & Iron Works, LLC]**
5. **[Folding Guard, Incorporated]**
6. **[G-S Company (The)]**
7. **[Indiana Wire Products, Inc]**
8. **[Jesco Industries, Inc.]**
9. **[Kenco Wire & Iron Products Inc.]**
10. **[King Wire Partitions, Inc]**
11. **[Miller Wire Works, Inc]**
12. **[Newark Wire Works Inc]**
13. **[R. J. Donaldson, Inc.]**
14. **[SpaceGuard Products]**
15. **[Standard Wire & Steel Works]**
16. **[WireCrafters, LLC]**
17. **<Insert manufacturer's name>**

2.2 SOURCE LIMITATIONS

- A. For wire mesh products, obtain each color, grade, finish, type, and variety from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wire mesh units.
- B. Structural Performance: Wire mesh units to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Concentrated load of **50 lbf (0.22 kN)** applied horizontally on an area of **1 sq. ft. (0.093 sq. m)** at any location on a panel.
 2. Total load of **[200 lbf (0.89 kN)]<Insert value>** applied uniformly over each panel.
 3. Concentrated load and total load need not be assumed to act concurrently.
 4. **<Insert loads or load combinations>**.
- C. Seismic Performance: Wire mesh units to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.
- D. Regulatory Requirements: Comply with applicable provisions in **[the United States Access Board's ADA-ABA Accessibility Guidelines][and][ICC A117.1]** for doors and gates designated as accessible.

2.4 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Mesh: **0.135-inch- (3.5-mm-)** diameter, intermediate-crimp steel wire woven into **1-1/2-inch (38-mm)** diamond mesh.
- B. Vertical Panel Framing: **1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm)** cold-rolled, C-shaped steel channels with holes for **1/4-inch- (6-mm-)** diameter bolts not more than **12 inches (300 mm)** o.c.
- C. Horizontal Panel Framing: **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channels.
- D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, **3/4 by 3/8 by 1/8 inch (19 by 9.5 by 3.2 mm)**, bolted or riveted toe to toe through mesh; or one **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channel with wire mesh woven through channel.
- E. Top Capping Bars: **2-1/4-by-1-inch (57-by-25-mm)** cold-rolled steel channels.
- F. Posts for 90-Degree Corners: **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3.2-mm)** steel angles or square tubes with holes for **1/4-inch- (6-mm-)** diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
- G. Posts for Other-Than-90-Degree Corners: Steel pipe or tubing with holes for **1/4-inch- (6-mm-)** diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
1. Partitions up to **12 Ft. (3.7 m)** High: **1-1/4-inch (32-mm)** OD by **1/8 inch (3.2 mm)**.
 2. Partitions up to **20 Ft. (6.1 m)** High: **2-1/2-inch (65-mm)** OD by **1/8 inch (3.2 mm)**.
- H. Adjustable Corner Posts: Two **1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm)** cold-rolled, C-shaped

steel channels connected by steel hinges at **36 inches (900 mm)** o.c., with holes for **1/4-inch- (6-mm-)** diameter bolts aligning with bolt holes in vertical framing.

- I. Line Posts: **3-inch-by-4.1-lb (76-mm-by-1.9-kg)** or **3-1/2-by-1-1/4-by-0.127-inch (89-by-32-by-3.2-mm)** steel channels; with **1/4-inch (6.4-mm)** steel base plates.
- J. Three-Way Intersection Posts: **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3.2-mm)** steel tubes or channels, with holes for **1/4-inch- (6-mm-)** diameter bolts aligned for bolting to adjacent panels.
- K. Four-Way Intersection Posts: **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3.2-mm)** steel tubes, with holes for **1/4-inch- (6-mm-)** diameter bolts aligned for bolting to adjacent panels.
- L. Floor Shoes: Metal, not less than **2 inches (50 mm)** high; sized to suit vertical framing, drilled for attachment to floor, and with setscrews for leveling adjustment.
- M. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm)** steel channels or **1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm)** cold-rolled, C-shaped steel channels, banded with **1-1/4-by-1/8-inch (32-by-3.2-mm)** flat steel bar cover plates on **[three][four]** sides, and with **1/8-inch- (3.2-mm-)** thick angle strike bar and cover on strike jamb.
 1. Hinges: Full-surface type, **3-by-3-inch (76-by-76-mm)** steel, three per door; bolted, riveted, or welded to door and jamb framing.
 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 3. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in Section 087100 "Door Hardware"]**; operated by key outside and **[recessed turn knob][knob][lever]** inside.
 4. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.
- N. Swinging Dutch Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm)** steel channels or **1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm)** cold-rolled, C-shaped steel channels, banded with **1-1/4-by-1/8-inch (32-by-3.2-mm)** flat steel bar cover plates on **[three][four]** sides, and with **1/8-inch- (3.2-mm-)** thick angle strike bar and cover on strike jamb.
 1. Hinges: Full-surface type, **3-by-3-inch (76-by-76-mm)** steel, two per section of door (top and bottom); bolted, riveted, or welded to door and jamb framing.
 2. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in Section 087100 "Door Hardware"]**; operated by key outside and **[recessed turn knob][knob][lever]** inside; mounted in lower section of door.
 3. Bolt: Mounted in, securing upper section of door.
 4. Shelf: Fabricated from **0.097-inch- (2.5-mm-)** thick, steel sheet, **[12 inches (300 mm)][18 inches (450 mm)]** deep by full width of door less **4 inches (102 mm)**; with corners rounded and edges finished smooth; mounted on top of lower section of door and braced with manufacturer's standard brackets.
- O. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** steel channels, banded with **1-1/2-by-1/8-inch (38-by-3.2-mm)** flat steel bar cover plates on four sides.
 1. Hardware: Two, four-wheel roller-bearing carriers; box track; and bottom guide channel for each door.
 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 3. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in**



Section 087100 "Door Hardware"[cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"]; operated by key outside and [recessed turn knob][knob][lever] inside.

- P. Vertically Sliding Service Windows: Fabricated from same mesh and framing as panels and equipped with [spring catch][slide bolts] on each jamb to lock window in open position and a padlock lug to lock window in closed position. Include opening frame in partition fabricated from 1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm) steel channels.
1. Size: [24 inches wide by 18 inches high (600 mm wide by 450 mm high)][24 inches wide by 21-1/2 inches high (600 mm wide by 546 mm high)][As indicated]<Insert dimensions>.
 2. Shelf: Fabricated from 0.097-inch- (2.5-mm-) thick, steel sheet; with corners rounded and edges finished smooth; braced with manufacturer's standard brackets.
 - a. Size: [23 inches wide by 12 inches deep (590 mm wide by 300 mm deep)][As indicated]<Insert dimensions>.
- Q. Swinging Service Windows: Fabricated from same mesh and framing as panels and equipped with spring catch on strike jamb that locks window in closed position. Include opening frame in partition fabricated from 1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm) steel channels.
1. Size: [24 inches wide by 18 inches high (600 mm wide by 450 mm high)][24 inches wide by 15 inches high (600 mm wide by 380 mm high)][As indicated]<Insert dimensions>.
 2. Shelf: Fabricated from 0.097-inch- (2.5-mm-) thick, steel sheet; with corners rounded and edges finished smooth; braced with manufacturer's standard brackets.
 - a. Size: [24 inches wide by 12 inches deep (600 mm wide by 300 mm deep)][24 inches wide by 15-3/4 inches deep (600 mm wide by 400 mm deep)][As indicated]<Insert dimensions>.
- R. Accessories:
1. Sheet Metal Base: [0.060-inch- (1.5-mm-)][0.035-inch- (0.9-mm-)] thick, steel sheet.
 2. Adjustable Filler Panels: 0.060-inch- (1.5-mm-) thick, steel sheet; capable of filling openings from 2 to 12 inches (50 to 300 mm).
 3. Wall Clips: Manufacturer's standard, steel sheet[; allowing up to 1 inch (25 mm) of adjustment].
- S. Finish: [Hot-dip galvanized][Hot-dip galvanized and shop primed for field painting][Shop primed for field painting][Enamel finish][Powder-coated finish] unless otherwise indicated.
1. Color: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>.

2.5 HEAVY-DUTY WIRE MESH PARTITIONS

- A. Mesh:
1. 0.192-inch- (4.9-mm-) diameter, intermediate-crimp steel wire woven into 2-inch (50-mm) diamond mesh.
 2. 0.192-inch- (4.9-mm-) diameter steel wire, resistance welded into 1-1/2-by-2-1/2-inch (38-mm-by-65-mm) rectangular mesh.
- B. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) cold-rolled

steel channels; with holes for **3/8-inch- (9.5-mm-)** diameter bolts not more than **12 inches (300 mm)** o.c.

- C. Horizontal Panel Stiffeners: Two cold-rolled steel channels, **1 by 1/2 by 1/8 inch (25 by 13 by 3.2 mm)**, bolted or riveted toe to toe through mesh.
- D. Top Capping Bars: **3-by-1-inch (76-by-25-mm)** steel channels.
- E. Posts for 90-Degree Corners: **1-1/2-by-1-1/2-by-1/8-inch (38-by-38-by-3.2-mm)** steel angles or tubes[**or 2-by-2-by-0.075-inch (50-by-50-by-1.9-mm) cold-rolled steel angles or tubes**], with holes for **3/8-inch- (9.5-mm-)** diameter bolts aligning with bolt holes in vertical framing; with **1/4-inch (6.4-mm)** steel base plates.
- F. Posts for Other-Than-90-Degree Corners: **2-inch- (50-mm)** OD by **1/8-inch (3.2-mm)** steel pipe or round tube, with holes for **3/8-inch- (9.5-mm-)** diameter bolts aligning with bolt holes in vertical framing; with **1/4-inch (6.4-mm)** steel base plates.
- G. Adjustable Corner Posts: Two **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** cold-rolled, steel channels or **2-by-2-by-0.075-inch (50-by-50-by-1.9-mm)** steel tubes connected by steel hinges at **36 inches (900 mm)** o.c. attached to posts; with **1/4-inch- (6-mm-)** diameter bolt holes aligning with bolt holes in vertical framing; with **1/4-inch (6.4-mm)** steel base plates.
- H. Line Posts: **3-inch-by-4.1-lb (76-mm-by-1.9-kg)** or **3-1/2-by-1-1/4-by-1/8-inch (89-by-32-by-3.2-mm)** steel channels; with **1/4-inch (6.4-mm)** steel base plates.
- I. **[Three-][and][Four-]**Way Intersection Posts: **2-by-2-by-0.075-inch (50-by-50-by-1.9-mm)** steel tubes, with holes for **3/8-inch- (9.5-mm-)** diameter bolts aligned for bolting to adjacent panels; with **1/4-inch (6.4-mm)** steel base plates.
- J. Floor Shoes: Metal, not less than **2 inches (50 mm)** high; sized to suit vertical framing, drilled for attachment to floor, and with setscrews for leveling adjustment.
- K. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** steel channels, banded with **1-1/2-by-1/8-inch (38-by-3.2-mm)** flat steel bar cover plates on four sides, and with **1/8-inch- (3.2-mm-)** thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, **3-1/2-by-3-1/2-inch (89-by-89-mm)** steel, three per door; bolted, riveted, or welded to door and jamb framing.
 - 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 - 3. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in Section 087100 "Door Hardware"]****[cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"]**; operated by key outside and **[recessed turn knob][knob][lever]** inside; mounted in lower section of door.
 - 4. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.
- L. Swinging Dutch Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** steel channels, banded with **1-1/2-by-1/8-inch (38-by-3.2-mm)** flat steel bar cover plates on **[three][four]** sides, and with **1/8-inch- (3.2-mm-)** thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, **3-1/2-by-3-1/2-inch (89-by-89-mm)** steel, two per section of door (top and bottom); bolted, riveted, or welded to door and jamb framing.
 - 2. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in Section 087100 "Door Hardware"]****[cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"]**; operated by key outside and **[recessed turn knob][knob][lever]**

- inside; mounted in lower section of door.
3. Bolt: Mounted in, securing upper section of door.
 4. Shelf: Fabricated from **0.097-inch- (2.5-mm-)** thick, steel sheet, **[12 inches (300 mm)][18 inches (450 mm)]** deep by full width of door less **4 inches (102 mm)**; with corners rounded and edges finished smooth; mounted on top of lower section of door and braced with manufacturer's standard brackets.
- M. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** steel channels, banded with **1-1/2-by-1/8-inch (38-by-3.2-mm)** flat steel bar cover plates on four sides.
1. Hardware: Two, four-wheel roller-bearing carriers; box track; and bottom guide channel for each door.
 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 3. Cylinder Lock: Mortise type with **[manufacturer's standard cylinder][cylinder specified in Section 087100 "Door Hardware"]****[cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"]**; operated by key outside and **[recessed turn knob][knob][lever]** inside; mounted in lower section of door.
- N. Vertically Sliding Service Windows: Fabricated from same mesh and framing as panels and equipped with **[spring catch][slide bolts]** on each jamb to lock window in open and closed positions. Include opening frame in partition fabricated from **1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm)** steel channels.
1. Size: **[24 inches wide by 18 inches high (600 mm wide by 450 mm high)][24 inches wide by 21-1/2 inches high (600 mm wide by 546 mm high)][As indicated]<Insert dimensions>**.
 2. Shelf: Fabricated from **0.097-inch- (2.5-mm-)** thick, steel sheet; with corners rounded and edges finished smooth; braced with manufacturer's standard brackets.
 - a. Size: **[24 inches wide by 12 inches deep (600 mm wide by 300 mm deep)][As indicated]<Insert dimensions>**.
- O. Swinging Service Windows: Fabricated from same mesh and framing as panels and equipped with spring catch on strike jamb that locks window in closed position. Include opening frame in partition fabricated from **1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm)** steel channels.
1. Size: **[24 inches wide by 18 inches high (600 mm wide by 450 mm high)][24 inches wide by 15 inches high (600 mm wide by 380 mm high)][As indicated]<Insert dimensions>**.
 2. Shelf: Fabricated from **0.097-inch- (2.5-mm-)** thick, steel sheet; with corners rounded and edges finished smooth; braced with manufacturer's standard brackets.
 - a. Size: **[24 inches wide by 12 inches deep (600 mm wide by 300 mm deep)][24 inches wide by 15-3/4 inches deep (600 mm wide by 400 mm deep)][As indicated]<Insert dimensions>**.
- P. Accessories:
1. Sheet Metal Base: **0.060-inch- (1.5-mm-)** thick, steel sheet.
 2. Adjustable Filler Panels: **0.060-inch- (1.5-mm-)** thick, steel sheet; capable of filling openings from **2 to 12 inches (50 to 300 mm)**.
 3. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; **[allowing up to 1 inch (25 mm) of adjustment]**.
- Q. Finish: **[Hot-dip galvanized][Hot-dip galvanized and shop primed for field painting][Shop primed for field painting][Enamel finish][Powder-coated finish]** unless otherwise indicated.

1. Color: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>.**

2.6 WIRE MESH CEILINGS

- A. Mesh, Framing, and Stiffeners: Fabricated from same mesh and framing as wire mesh partition panels.
- B. Perimeter Partition Supports: **[1-1/2-by-1-1/2-by-1/8-inch (38-by-38-by-3.2-mm)][1-1/2-by-1-1/2-by-0.075-inch (38-by-38-by-1.9-mm)]** steel angle, with holes for **1/4-inch- (6-mm-)** diameter bolts aligned for bolting to top of wire mesh partitions and to sides of wire mesh ceiling panels.
- C. Wall Supports: **[1-1/2-by-1-1/2-by-1/8-inch (38-by-38-by-3.2-mm)][1-1/2-by-1-1/2-by-0.075-inch (38-by-38-by-1.9-mm)]** steel angle punched for attachment to wall and wire mesh ceiling panels.
- D. Intermediate Supports: Steel I-beams or rectangular tubes, as recommended by manufacturer.
- E. Intermediate Support Posts: **[2-by-2-by-1/8-inch (50-by-50-by-3.2-mm)][2-by-2-by-0.075-inch (50-by-50-by-1.9-mm)]** steel tubes.
- F. Finishes: Match adjacent wire mesh partitions.

2.7 WIRE MESH STAIRWAY PARTITIONS

- A. Standard-Duty Stairway Partitions:
 1. Diamond Mesh: **0.135-inch- (3.5-mm-)** diameter, intermediate-crimp steel wire woven into **1-1/2-inch (38-mm)** diamond pattern and securely clinched to frames.
 2. Square Mesh: **0.135-inch- (3.5-mm-)** diameter, **[intermediate][lock]**-crimp steel wire woven into **1-1/2-inch (38-mm)** square pattern, inserted through frame holes and welded into frame. Vertical wires are plumb, and horizontal wires are perpendicular to vertical wires.
 3. Rectangular Mesh: **0.135-inch- (3.5-mm-)** diameter, **[intermediate][lock]**-crimp steel wire woven into **2-by-1-inch (50-by-25-mm)** rectangular pattern, inserted through frame holes and welded into frame. Vertical wires are plumb, and horizontal wires are perpendicular to vertical wires.
 4. Vertical Panel Framing: **1-1/4-by-5/8-by-0.097-inch (32-by-16-by-2.5-mm)** cold-rolled, C-shaped steel channels; with **1/4-inch- (6-mm-)** diameter bolt holes spaced not more than **18 inches (450 mm)** o.c. along center of framing.
 5. Horizontal Panel Framing: **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channels.
 6. Horizontal Panel Stiffeners: **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channels with wire woven through, or two **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channels bolted or riveted toe to toe through mesh.
- B. Heavy-Duty Stairway Partitions:
 1. Diamond Mesh: **0.192-inch- (4.9-mm-)** diameter, intermediate-crimp steel wire woven into **2-inch (50-mm)** diamond pattern and securely clinched to frames.
 2. Square Mesh: **0.192-inch- (4.9-mm-)** diameter, **[intermediate][lock]**-crimp steel wire woven into **2-inch (50-mm)** square pattern, inserted through frame holes and welded into frame. Vertical wires are plumb, and horizontal wires are perpendicular to vertical wires.
 3. Rectangular Mesh: **0.192-inch- (4.9-mm-)** diameter, **[intermediate][lock]**-crimp steel wire woven into **2-by-1-inch (50-by-25-mm)** rectangular pattern, inserted through frame holes and welded into frame. Vertical wires are plumb, and horizontal wires are perpendicular to vertical wires.
 4. Vertical and Horizontal Panel Framing: **1-1/2-by-3/4-by-0.097-inch (38-by-19-by-2.5-mm)** cold-rolled, C-shaped steel channels; with **3/8-inch- (9.5-mm-)** diameter bolt holes spaced not more

than **18 inches (450 mm)** o.c. along center of framing.

5. Horizontal Panel Stiffeners: **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** cold-rolled steel channels with wire woven through, or two **1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm)** cold-rolled steel channels bolted or riveted toe to toe through mesh.

- C. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from **1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm)** steel channels, banded with **1-1/2-by-1/8-inch (38-by-3.2-mm)** flat steel bar cover plates on **[three][four]** sides, and with **1/8-inch- (3.2-mm-)** thick angle strike bar and cover on strike jamb.

1. Hinges: Full-surface spring type, **3-1/2-by-3-1/2-inch (89-by-89-mm)** steel, one and a half pairs per door; bolted, riveted, or welded to door and jamb framing.
2. Exit Device: As specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**
3. Tamper Shield: Fabricated from **0.097-inch- (2.5-mm-)** thick, cold-rolled steel sheet; **15 inches (380 mm)** high by width of door.

- D. Door Jamb Framing: **2-by-2-by-1/8-inch (50-by-50-by-3.2-mm)** steel pipe or tubing.

- E. Floor Shoes: Steel, cast iron, or cast aluminum, not less than **2 inches (50 mm)** high; sized to suit vertical framing, drilled for attachment to floor, and with setscrews for leveling adjustment.

- F. Wall Clips: Manufacturer's standard, cold-rolled steel sheet[; **allowing up to 1 inch (25 mm) of adjustment**].

- G. Finish for Uncoated Ferrous Steel: **[Hot-dip galvanized][Hot-dip galvanized and shop primed for field painting][Shop primed for field painting][Enamel finish][Powder-coated finish]** unless otherwise indicated.

1. Color: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>**.

2.8 WIRE MESH EQUIPMENT BARRIERS

- A. Mesh: **0.135-inch- (3.5-mm-)** diameter, intermediate-crimp steel wire woven into **[1-1/2-inch (38-mm) diamond][1-by-2-inch (25-by-50-mm) rectangular]** mesh.

- B. Panels: **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3.2-mm)** steel angle framing on four sides, with wire mesh welded to framing.

1. Horizontal Panel Stiffeners: **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3.2-mm)** steel angles or **3/4-by-1/4-inch (19-by-6.4-mm)** hot-rolled steel flat bars.
2. Height: **[48 inches (1220 mm)][60 inches (1524 mm)]<Insert dimension>**.

- C. Line and Corner Posts: **2-by-2-by-0.068-inch (50-by-50-by-1.7-mm)** steel tubing with steel base plates welded to bottoms, drilled for attachment to floor, and with steel caps welded to tops.

1. Height: Panel height plus **[12-inch- (300-mm-)]<Insert dimension>** high, sweep space.

- D. Swinging Gates: Fabricated from same mesh as panels, with gate framing fabricated from **1-1/4-by-1-1/4-by-3/16-inch (32-by-32-by-4.7-mm)** steel angles on four sides, and with wire mesh welded to framing.

1. Hinges: Full-surface[**spring**] type, **3-1/2-by-3-1/2-inch (89-by-89-mm)** steel, one pair per door; bolted, riveted, or welded to door and jamb framing.
 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 3. Cylinder Lock: Mortise type with [**manufacturer's standard cylinder**][**cylinder specified in Section 087100 "Door Hardware"**][**cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"**]; operated by key outside and [**recessed turn knob**][**knob**][**lever**] inside.
- E. Sliding Gates: Fabricated from same mesh as panels, with framing fabricated from **1-1/4-by-1-1/4-by-3/16-inch (32-by-32-by-4.7-mm)** steel angles on four sides, and with wire mesh welded to framing.
1. Hardware: Two, four-wheel roller-bearing carriers; box track; and bottom guide channel for each door.
 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
 3. Cylinder Lock: Mortise type with [**manufacturer's standard cylinder**][**cylinder specified in Section 087100 "Door Hardware"**][**cylinder specified in Section 087111 "Door Hardware (Descriptive Specification)"**]; operated by key outside and [**recessed turn knob**][**knob**][**lever**] inside.
- F. Finish for Uncoated Ferrous Steel: [**Hot-dip galvanized**][**Hot-dip galvanized and shop primed for field painting**][**Shop primed for field painting**][**Enamel finish**][**Powder-coated finish**] unless otherwise indicated.
1. Color: [**As indicated by manufacturer's designations**][**Match Architect's samples**][**As selected by Architect from manufacturer's full range**] <Insert color>.

2.9 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**] <Insert value> percent.
- B. Steel Wire: ASTM A510/A510M.
- C. Steel Plates, Channels, Angles, and Bars: ASTM A36/A36M.
- D. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M, Commercial Steel (CS), Type B.
- E. Steel Pipe: ASTM A53/A53M, Schedule 40, unless another weight is indicated or required by structural loads.
- F. Steel Tubing: ASTM A500/A500M, cold-formed structural-steel tubing or ASTM A513/A513M, Type 5, mandrel-drawn mechanical tubing.
- G. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
- H. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.
- I. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
 1. Material for Interior Locations: Carbon-steel components are zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)][Group 2 (A4)]** stainless steel bolts, **ASTM F593 (ISO 3506)**, and nuts, **ASTM F594 (ASTM F836M)**.

- J. Power-Driven Fasteners: ICC-ES AC70.
- K. Seismic Bracing: Angles with legs not less than **1-1/4 inches (32 mm)** wide, formed from **0.040-inch- (1.0-mm-)** thick, metallic-coated steel sheet; with bolted connections and **1/4-inch- (6-mm-)** diameter bolts.
- L. Shop Primers: Provide primers that comply with **[Section 099113 "Exterior Painting"]****[and]****[Section 099123 "Interior Painting."]**
- M. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- N. Zinc-Rich Primer: Compatible with topcoat, complying with SSPC-Paint 20 or SSPC-Paint 29.
- O. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.10 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 1. Fabricate wire mesh items to be readily disassembled.
 2. Welding: Weld corner joints of framing and **[grind smooth, leaving no evidence of joint]****[finish sand]****[remove spatter]****[leave as applied]**.
- B. **[Standard-]****[and]****[Heavy-]**Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 1. Mesh: **[Securely clinch]****[Weld]** mesh to framing.
 2. Framing: Fabricate framing with mortise-and-tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 - b. Fabricate **[three-]****[and]****[four-]**way intersections using **[intersection posts]****[manufacturer's standard connecting clips and fasteners]**.
 - c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.
 3. Fabricate wire mesh partitions with **3 to 4 inches (75 to 100 mm)** of clear space between finished floor and bottom horizontal framing.
 4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
 5. Doors: Align bottom of door with bottom of adjacent panels.
 - a. For doors that do not extend full height of partition, provide transom over door, fabricated

from same mesh and framing as partition panels.

6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.
- C. Wire Mesh Ceilings: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 1. Mesh: **[Securely clinch][Weld]** mesh to framing.
 2. Framing: Fabricate framing with **[mortise-and-tenon][welded]** corner construction.
 - a. Provide stiffeners as indicated or, if not indicated, as required by panel span and as recommended by wire mesh ceiling manufacturer. Weld stiffeners to framing.
- D. Wire Mesh Stairway Partitions: Provide door jamb framing on each side of doors. Attach tamper shields centered behind exit devices.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean items of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Preparation for Shop Priming: Prepare surfaces to comply with **[SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."][SSPC-SP 3, "Power Tool Cleaning."]**
- D. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- E. Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard enamel finish, suitable for use indicated, with a minimum dry film thickness of **[2 mils (0.05 mm)]<Insert dimension>**.
 1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- F. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of **[2 mils (0.05 mm)]<Insert dimension>**.
 1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and

other conditions affecting performance of the Work.

- B. Examine floors for suitable conditions where wire mesh items will be installed.
- C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF WIRE MESH PARTITIONS

- A. Anchor wire mesh partitions to floor with **3/8-inch- (9.5-mm-)** diameter, postinstalled expansion anchors at **12 inches (300 mm)** o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.
 - 1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- B. Anchor wire mesh partitions to floor with **3/8-inch- (9.5-mm-)** diameter, postinstalled expansion anchors at **12 inches (305 mm)** o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
 - 1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- C. Anchor wire mesh partitions to walls at **12 inches (305 mm)** o.c. through back corner panel framing and as follows:
 - 1. For concrete and solid masonry anchorage, use expansion anchors.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
- D. Secure top capping bars to top framing channels with **1/4-inch- (6-mm-)** diameter, "U" bolts spaced not more than **28 inches (700 mm)** o.c.
- E. Provide line posts at locations indicated or, if not indicated, as follows:
 - 1. On each side of sliding-door openings.
 - 2. For partitions that are **7 to 9 ft. (2.1 to 2.7 m)** high, spaced at **15 to 20 ft. (4.6 to 6.1 m)** o.c.
 - 3. For partitions that are **10 to 12 ft. (3.0 to 3.7 m)** high, located between every other panel.
 - 4. For partitions that are more than **12 ft. (3.7 m)** high, located between each panel.
- F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.

- H. Install doors complete with door hardware.
- I. Install service windows complete with window hardware.
- J. Weld or bolt sheet metal bases to **[wire mesh partitions][and][doors][where indicated]**.
- K. Bolt accessories to wire mesh partition framing.

3.3 INSTALLATION OF WIRE MESH CEILINGS

- A. Anchor wall support angle to walls at **12 inches (300 mm)** o.c. and as follows:
 - 1. For concrete and solid masonry anchorage, use expansion anchors.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
- B. Attach wire mesh ceiling panels to wall support angles with bolts at **12 inches (305 mm)** o.c.
- C. Attach wire mesh ceiling panels to wire mesh partitions with slotted angles bolted to sides of ceiling panels and to top of partitions at **12 inches (305 mm)** o.c.
- D. Attach wire mesh ceiling panels to intermediate supports as recommended by manufacturer.
- E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.

3.4 INSTALLATION OF WIRE MESH STAIRWAY PARTITIONS

- A. Anchor wire mesh stairway partitions to floor with **3/8-inch- (9.5-mm-)** diameter, postinstalled expansion anchors at **12 inches (305 mm)** o.c. through floor shoes located at each post. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
 - 1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- B. Anchor angle clips supporting wire mesh stairway partitions at stairs and intermediate landings with **3/8-inch- (9.5-mm-)** diameter, postinstalled expansion anchors at **12 inches (305 mm)** o.c. Weld stairway partition framing to angle clips.
 - 1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- C. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability; extend and fasten members to supporting structure.
- D. Install doors complete with door hardware.

3.5 INSTALLATION OF WIRE MESH EQUIPMENT BARRIERS

- A. Anchor wire mesh equipment barriers to floor with **3/8-inch- (9.5-mm-)** diameter, expansion anchors through post bases. Shim post bases as required to achieve level and plumb installation.
- B. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- C. Install gates complete with gate hardware.

3.6 REPAIR

- A. Repair Painting:
 - 1. Wire brush and clean rust spots, welds, and abraded areas immediately after installation, and apply repair paint with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
 - 2. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.7 ADJUSTING

- A. Adjust [**doors**][**gates**][**service windows**] to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Verify that latches and locks engage accurately and securely without forcing or binding.

3.8 PROTECTION

- A. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.

END OF SECTION 10 22 13 00



Task	Specification	Specification Description
10 22 13 00	10 22 00 00	Folding Panel Partitions
10 22 13 00	10 22 00 00a	All-Glass Partitions



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SECTION 10 22 19 00 - DEMOUNTABLE PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Site-assembled demountable partitions.
2. Unitized-panel demountable partitions.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Site-assembled demountable partitions.
2. Unitized-panel demountable partitions.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
7. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
8. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
9. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
10. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
12. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
13. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For demountable partitions.

1. Include plans, elevations, sections, and attachment details at floors, columns, permanent partitions, and ceilings; and method of erection and disassembly.



2. Include diagrams for power-, signal-, and control-wiring raceways; and details of access to raceways.
- D. Samples: For each exposed product and for each color and texture specified, **[in manufacturer's standard sizes][6 inches (150 mm) square in size]<Insert dimensions>**.
- E. Samples for Initial Selection: For each type of exposed finish.
 1. Include Samples of hardware and accessories involving color or finish selection.
- F. Samples for Verification: For each type of the following products:
 1. Face-Panel Finish: Manufacturer's standard-size unit, but not less than **[6 inches (150 mm) square]<Insert dimensions>**.
 2. Linear Trim: **[12-inch- (300-mm-)]<Insert dimension>** long Samples.
 3. Door Finish: Manufacturer's standard-size unit, but not less than **[3 inches (75 mm) square]<Insert dimensions>**.
 4. Glazing: Manufacturer's standard-size unit, but not less than **[3 inches (75 mm) square]<Insert dimensions>**.
 5. Hardware and Accessories: **[Whole units]<Insert requirement>**.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from the installers of the items involved:
 1. Suspended-ceiling components and dimensioned ceiling-grid layout.
 2. Locations of fixed door and window mullions.
 3. Overhead bracing, seismic restraints, and related structural members.
 4. Ductwork above ceiling.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of demountable partition.
- D. Product Test Reports: For each type of demountable-partition assembly, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For demountable partitions to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same production run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Partition Components: Furnish a quantity of each type of full-size unit with installation tools and materials equal to **[one][two]<Insert number>** percent of the amount installed, but no fewer than **<Insert number>** units.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- F. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups for demountable partitions including accessories.
 - a. Size: **[48 inches (1200 mm) by full height][48 inches (1200 mm) by 48 inches (1200 mm) by full height corner]<Insert dimensions>**.
 - b. **[Each type of exposed construction][corner][door and frame][glass and frame][and][accessory panel]<Insert mockup item>**.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install demountable partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **[25]<Insert value>** or less.
 - 2. Smoke-Developed Index: **[450]<Insert value>** or less.
- B. Structural Performance: Provide demountable partitions capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Load-Bearing Capacity: Not less than **[300 lb (136 kg) concentrated][2.3 lb/linear inch (0.041 kg/linear mm) distributed]<Insert load>** proof load when tested according to BIFMA X 5.6.

2. Transverse-Load Capacity: Lateral deflection of not more than **[1/120][1/240]** of the overall span when tested under a uniformly distributed load of **5 lb/sq. ft. (24.4 kg/sq. m)** according to ASTM E72.

- C. Acoustical Performance: Where acoustical rating is indicated, provide demountable-partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

2.2 SITE-ASSEMBLED DEMOUNTABLE PARTITIONS

- A. Site-Assembled Demountable Partitions : Site-assembled, **[progressive],[nonprogressive,]** demountable-partition assembly and components that are the standard products of manufacturer.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Avanti Systems USA]**
- b. **[DIRTT Environmental Solutions]**
- c. **[dormakaba USA Inc.]**
- d. **[Gravity Lock Systems, Inc]**
- e. **[Hugh Robinson, Inc.]**
- f. **[IMT Modular Partitions Ltd.]**
- g. **[Inscape Corporation]**
- h. **[Lindner Group]**
- i. **[MAARS Living Walls; Maars US Inc.]**
- j. **[McCain Walls; SwiftWall Solutions]**
- k. **[Neslo Manufacturing; a division of Musano, Inc.]**
- l. **[Nordwall USA LLC]**
- m. **[OldCastle BuildingEnvelope (OBE)]**
- n. **[ProPart Modular]**
- o. **[Special-Lite]**
- p. **[Steelcase Inc.]**
- q. **[U.S. Aluminum; C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
- r. **[ULTRAWALL LLC]**
- s. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Avanti Systems USA]**
- b. **[DIRTT Environmental Solutions]**
- c. **[dormakaba USA Inc.]**
- d. **[Gravity Lock Systems, Inc]**
- e. **[Hugh Robinson, Inc.]**
- f. **[IMT Modular Partitions Ltd.]**
- g. **[Inscape Corporation]**
- h. **[Lindner Group]**
- i. **[MAARS Living Walls; Maars US Inc.]**
- j. **[McCain Walls; SwiftWall Solutions]**
- k. **[Neslo Manufacturing; a division of Musano, Inc.]**
- l. **[Nordwall USA LLC]**

- m. **[OldCastle BuildingEnvelope (OBE)]**
 - n. **[ProPart Modular]**
 - o. **[Special-Lite]**
 - p. **[Steelcase Inc.]**
 - q. **[U.S. Aluminum; C.R. Laurence Co., Inc.; CRH Americas, Inc.]**
 - r. **[ULTRAWALL LLC]**
 - s. **<Insert manufacturer's name>**

- B. Acoustical Rating: STC **[35]<Insert value>**.

- C. Face Panels: Manufacturer's standard **[gypsum board][particleboard][steel-sheet-faced gypsum board][or][stainless steel-sheet-faced gypsum board]<Insert description>** substrate.
 - 1. Thickness: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][Manufacturer's standard][As indicated on Drawings]<Insert thickness>**.
 - 2. Panel Widths: Modular, **[24 inches (610 mm)][30 inches (762 mm)][as indicated on Drawings][as selected by Architect from manufacturer's standard widths]<Insert requirement>**, except for required filler panels.
 - 3. Finish: **[As indicated on Drawings][Unfinished][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][No. 4 satin polish on stainless steel]<Insert requirement>**.
 - a. Color: **[As indicated on Drawings][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 - 4. Facing: **[Vinyl wall covering][Fabric][Carpet wall covering][Plastic laminate][Wood veneer][Owner-furnished material]<Insert requirement>**.
 - a. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 - b. Wood-Veneer Species and Finish: **[Species as indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][White ash][Red oak][Birch]<Insert species>** with **[transparent finish.][transparent finish over stain.][wood finish as specified in Section 099300 "Staining and Transparent Finishing."]<Insert requirement>**.

- D. Accessory Panels: Manufacturer's standard **[fabric-covered tackboard][porcelain-enamel markerboard][porcelain-enamel chalkboard]<Insert description>**.

- E. Framing: **[Metallic-coated steel][or][aluminum]** studs and top and bottom tracks, **[2-1/2 inches (64 mm) deep][4 inches (102 mm) deep][manufacturer's standard depth][depth as indicated on Drawings]<Insert requirement>**.

- F. Trim: Continuous, factory-finished, snap-on type; adjustable for variations in **[floor level][floor and ceiling levels]**.
 - 1. Trim Material: **[Vinyl][steel][stainless steel][or][aluminum]**.
 - 2. Panel Joints: **[Butt joints without trim][Closure trim]<Insert description>**.
 - 3. Outside Corner Trim: **[Square][Radiused]**.
 - 4. Base Profile: **[Recessed][Projected][Flush]<Insert description>**.
 - 5. Ceiling Trim Profile: **[Recessed][Projected]<Insert description>**.
 - 6. Cornice Trim: Continuous over tops of partial-height units for maximum stability.
 - 7. Exposed-Metal Trim Finish: **[Match metal face panels][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][No. 4 satin polish on**



8. **stainless steel][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>.**
Trim Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.**

G. Doors:

1. **[As specified in Section 081113 "Hollow Metal Doors and Frames."][As specified in Section 081416 "Flush Wood Doors."][As specified in Section 081433 "Stile and Rail Wood Doors."]<Insert requirement>.**
2. Manufacturer's standard **1-3/4-inch- (45-mm-)** thick, **[steel][solid-core wood][framed glass][frameless glass]<Insert material>** door construction.
 - a. Door Operation: **[Pivoting][Sliding][Swinging]<Insert requirement>.**
 - b. Door Finish: **[Match face panels of partition][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Plastic laminate][Wood veneer]<Insert requirement>.**
 - 1) Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.**
 - 2) Wood-Veneer Species and Finish: **[Species as indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][White ash][Red oak][Birch]<Insert species> with [transparent finish.][transparent finish over stain.][wood finish as specified in Section 099300 "Staining and Transparent Finishing."]<Insert requirement>.**

H. Door Frames: Manufacturer's standard **[steel][aluminum]** frames for **1-3/4-inch (45-mm)** doors[, **reversible][, factory mortised to receive hardware].**

1. Frame Finish: **[Match metal face panels][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>.**
2. Frame Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.**

I. Door Hardware: **[As selected by Architect from manufacturer's full range.][As specified in Section 087100 "Door Hardware."][As specified in Section 087111 "Door Hardware (Descriptive Specification)."]<Insert requirement>.**

J. Glazing Frames: Manufacturer's standard **[steel][aluminum]** frames for[**frameless (top and bottom-supported)]** glazing thickness indicated.

1. Frame Finish: **[Match door frames][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>.**
2. Frame Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.**

K. Glazing:

1. **[Fully tempered clear float glass][Insulating, fully tempered clear float glass][Laminated clear float glass][As indicated on Drawings]<Insert requirement>** as specified in Section 088000 "Glazing."
 - a. Thickness: **<Insert dimension>.**

2. Manufacturer's standard **[fully tempered clear float glass][insulating, fully tempered clear float glass][laminated clear float glass][glass as indicated on Drawings]<Insert requirement>**.
- L. Frameless Glazing: Manufacturer's standard **[fully tempered clear float glass][laminated clear float glass][glass as indicated on Drawings]<Insert requirement>** for butt-glazing with top and bottom support.
- M. Seals: **[Manufacturer's standard]<Insert requirement>**.
- N. Electrical Devices: Integral, concealed raceways to serve electrical power and communication devices indicated on Drawings.
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- O. Accessories: **<Insert description>**.

2.3 UNITIZED-PANEL DEMOUNTABLE PARTITIONS

- A. Unitized-Panel Demountable Partitions : Unitized, **[progressive,][nonprogressive,]** demountable-partition assembly and components that are the standard products of manufacturer.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[E2 Walls, Inc.]**
 - b. **[Fellowes, Inc.]**
 - c. **[Haworth, Inc]**
 - d. **[Hugh Robinson, Inc.]**
 - e. **[Inscape Corporation]**
 - f. **[KI]**
 - g. **[Lindner Group]**
 - h. **[MAARS Living Walls; Maars US Inc.]**
 - i. **[Nello Wall Systems, Inc.]**
 - j. **[Panel Systems Manufacturing, Inc]**
 - k. **[Steelcase Inc.]**
 - l. **[Superior Steel Door & Trim Company, Inc.]**
 - m. **[Transwall Office Systems, Inc.]**
 - n. **[Trendway Corporation]**
 - o. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[E2 Walls, Inc.]**
 - b. **[Fellowes, Inc.]**
 - c. **[Haworth, Inc]**
 - d. **[Hugh Robinson, Inc.]**
 - e. **[Inscape Corporation]**
 - f. **[KI]**
 - g. **[Lindner Group]**

- h. **[MAARS Living Walls; Maars US Inc.]**
 - i. **[Nello Wall Systems, Inc.]**
 - j. **[Panel Systems Manufacturing, Inc.]**
 - k. **[Steelcase Inc.]**
 - l. **[Superior Steel Door & Trim Company, Inc.]**
 - m. **[Transwall Office Systems, Inc.]**
 - n. **[Trendway Corporation]**
 - o. **<Insert manufacturer's name>**
- B. Acoustical Rating: STC **[35]<Insert value>**.
- C. Unitized Panels: Manufacturer's standard **[gypsum board][particleboard][steel-sheet-faced gypsum board][stainless steel-sheet-faced gypsum board]<Insert description>**.
- 1. Thickness: **[Manufacturer's standard][1-3/4 inches (45 mm)][2-1/4 inches (57 mm)]<Insert thickness>**.
 - 2. Panel Widths: Modular, **[24 inches (610 mm)][30 inches (762 mm)][as indicated on Drawings][as selected by Architect from manufacturer's standard widths]<Insert requirement>**, except for required filler panels.
 - 3. Finish: **[Unfinished][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][No. 4 satin polish on stainless steel]<Insert requirement>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 - 4. Facing: **[Vinyl wall covering][Fabric][Carpet wall covering][Plastic laminate][Wood veneer][Owner-furnished material]<Insert requirement>**.
 - a. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 - b. Wood-Veneer Species and Finish: **[Species as indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][White ash][Red oak][Birch]<Insert species> with [transparent finish.][transparent finish over stain.][wood finish as specified in Section 099300 "Staining and Transparent Finishing."]<Insert requirement>**.
- D. Accessory Panels: Manufacturer's standard **[fabric-covered tackboard][porcelain-enamel markerboard][porcelain-enamel chalkboard]<Insert description>**.
- E. Framing: **[Manufacturer's standard][Steel][Aluminum]<Insert material>**.
- 1. Exposed Finish: **[Match unitized panels][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>**.
 - 2. Color of Exposed Finish: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- F. Trim: Continuous, factory-finished, snap-on type; adjustable for variations in **[floor level][floor and ceiling levels]**.
- 1. Trim Material: **[Vinyl][steel][stainless steel][or][aluminum]**.
 - 2. Panel Joints: **[Butt joints without trim][Closure trim]<Insert description>**.
 - 3. Base Profile: **[Recessed][Projected][Flush]<Insert description>**.
 - 4. Ceiling Trim Profile: **[Recessed][Projected]<Insert description>**.

5. Cornice Trim: Continuous over tops of partial-height units for maximum stability.
 6. Exposed-Metal Trim Finish: **[Match unitized panels][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][No. 4 satin polish on stainless steel][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>**.
 7. Trim Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- G. Doors: Manufacturer's standard **1-3/4-inch- (45-mm-)** thick, **[steel][solid-core wood][framed glass][frameless glass]<Insert material>** door construction.
1. Door Operation: **[Pivoting][Sliding][Swinging]<Insert requirement>**.
 2. Door Finish: **[Match face panels of partition][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Plastic laminate][Wood veneer]<Insert requirement>**.
 - a. Color, Texture, and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>**.
 - b. Wood-Veneer Species and Finish: **[Species as indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][White ash][Red oak][Birch]<Insert species> with [transparent finish.][transparent finish over stain.][wood finish as specified in Section 099300 "Staining and Transparent Finishing."]<Insert requirement>**.
- H. Door Frames: Manufacturer's standard **[steel][aluminum]** frames for **1-3/4-inch (45-mm)** doors[, **reversible**][, **factory mortised to receive hardware**].
1. Frame Finish: **[Match metal face panels][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>**.
 2. Frame Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- I. Door Hardware: **[As selected by Architect from manufacturer's full range.][As specified in Section 087100 "Door Hardware."][As specified in Section 087111 "Door Hardware (Descriptive Specification)."]<Insert requirement>**.
- J. Glazing Frames: Manufacturer's standard **[steel][aluminum]** frames for[**frameless (top and bottom-supported)**] glazing thickness indicated.
1. Frame Finish: **[Match door frames][Factory primed for field painting][Factory-applied, baked-enamel or powder-coat finish][Clear-anodized aluminum][Color-anodized aluminum]<Insert requirement>**.
 2. Frame Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- K. Glazing:
1. **[Fully tempered clear float glass][Insulating, fully tempered clear float glass][Laminated clear float glass][As indicated on Drawings]<Insert requirement>** as specified in Section 088000 "Glazing."
 - a. Thickness: **<Insert dimension>**.
 2. Manufacturer's standard **[fully tempered clear float glass][insulating, fully tempered clear float glass][laminated clear float glass][glass as indicated on Drawings]<Insert**

requirement>.

- L. Frameless Glazing: Manufacturer's standard **[fully tempered clear float glass][laminated clear float glass][glass as indicated on Drawings]<Insert requirement>** for butt-glazing with top and bottom support.
- M. Seals: **[Manufacturer's standard]<Insert requirement>**.
- N. Electrical Devices: Integral, concealed raceways **[and wiring]** to serve electrical power and communication devices indicated on Drawings.
 - 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- O. Accessories: **<Insert description>**.

2.4 WOOD MATERIALS

- A. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
- B. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
- C. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- D. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- E. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- F. Composite Wood Products: Products shall be made without urea formaldehyde.
- G. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- I. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.

2. Particleboard: 0.09 ppm.
3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

J. Composite Wood Products: Products shall be made without urea formaldehyde.

K. Particleboard: Panels complying with ANSI A208.1, Grade M-2.

1. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less when tested according to ASTM E84 or UL 723.

L. Wood Veneer: Genuine wood veneer; clear, vertical grain, straight, and kiln dried; of wood species indicated, laminated to panel substrate with moisture-resistant adhesive.

2.5 OTHER MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25][60]<Insert value>** percent.
- B. Gypsum Board: ASTM C1396/C1396M.
- C. Vinyl Wall Covering: Manufacturer's standard, mildew-resistant, washable, vinyl-coated fabric wall covering; complying with W-101 for **[Type II][or][Type III]**; Class A.
 1. Total Weight: **<Insert weight>**.
 2. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.
- D. Fabric: **[Manufacturer's standard fabric][100 percent polyolefin woven fabric]<Insert fabric description>** wall covering, from same dye lot, treated to resist stains.
- E. Carpet Wall Covering: Manufacturer's standard **[nonwoven, needle-punched carpet with fibers fused to backing]**, from same dye lot, treated to resist stains, and meeting performance requirements for surface-burning characteristics.
- F. Plastic Laminate: High-pressure decorative laminate according to ISO 4586-3, **Grade VGL (vertical, general purpose)][, Grade VGF (vertical, flame retardant)]<Insert grade>**.
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.
- H. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Adhesives: Do not use adhesives that contain urea formaldehyde.
- K. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.6 FABRICATION

- A. General: Fabricate demountable walls for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed construction.
- B. Panels for Site-Assembled Demountable Partitions: Face panels fabricated and finished in modular widths indicated.
 - 1. Transom Panels: Fabricated in material and finish to match wall panels unless otherwise indicated.
- C. Panels for Unitized-Panel Demountable Partitions: Factory-assembled, flush, unitized-panel construction; with faces smooth and free of buckles, oil-canning, and seams; and insulated with solidly packed, inorganic, mineral filler.
 - 1. Factory glaze panels to the greatest extent possible.
- D. Finish Facings: Factory apply finish-facing materials with appropriate backings, using mildew-resistant nonstaining adhesive as recommended by finish-material manufacturer's written instructions.
 - 1. Apply facing to panel **[in one piece, seamless][with tightly butted invisible seams where indicated on Drawings]**, and with no gaps or overlaps; free of air bubbles, wrinkles, blisters, or other defects.
 - 2. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 - 3. Where facings with **[directional or repeating patterns or directional weave][directional, repeating, or matching grain]** are indicated, mark facing top and attach facing in same direction.
 - 4. Match facing pattern **72 inches (1830 mm)** above finished floor.
- E. Wiring: Conceal conductors and cables in raceways. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker over a **[nonspecular as fabricated]<Insert requirement>** mechanical finish.
- B. Color Anodic Finish: AAMA 611, **[Class I, 0.018 mm][Class II, 0.010 mm]** or thicker over a **[nonspecular as fabricated]<Insert requirement>** mechanical finish.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.9 STEEL FINISH

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry-film thickness.

2.10 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes **[vertical for vertical surfaces][and][parallel to long dimension for framing]<Insert requirement>**.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine components before installation. Reject components that are wet, moisture damaged, mold damaged, broken, cracked, chipped, deformed, or unmatched.
- C. Examine roughing-in for electrical power to verify actual locations of power connections before partition installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install demountable partitions after other finishing operations have been completed.
 - 1. Install partitions rigid, level, plumb, and aligned. Install seals at connections with floors, ceilings, fixed walls, and abutting surfaces to prevent light and sound transmission.
 - 2. Except for filler panels scribed to fixed walls or columns, do not modify manufacturer's standard components.
- B. Suspended-Ceiling System: **[Do not alter suspended-ceiling system][Make alterations to suspended-ceiling system required by partition installation or to gain access to electrical or communication systems without affecting the structural integrity of suspended-ceiling system. Make alterations so they are not noticeable after panel installation]<Insert requirement>**.
- C. Doors and Frames: Install door-and-frame[**and glazing-and-glazing-frame**] assemblies securely anchored to partitions and with doors aligned and fitted. Install and adjust door hardware for proper operation.



- D. Electrical Devices: Connect integral, concealed wiring to serve electrical power and communication devices indicated on Drawings.
 - 1. Connect electrical service at junction-box locations according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Connect data communication service at junction-box locations according to Section 271513 "Communications Copper Horizontal Cabling."

3.3 ERECTION TOLERANCES

- A. Install each demountable partition so surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by the faces of adjacent partitions.

3.4 ADJUSTING

- A. Inspect installation, correct misalignments, and tighten loose connections.
- B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer. Verify that latches and locks engage accurately and securely without forcing or binding.
- C. Remove and replace defaced or damaged components[**that cannot be satisfactorily repaired**].

3.5 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, assemble, disassemble, and maintain demountable partitions.

END OF SECTION 10 22 19 00



Task	Specification	Specification Description
10 22 19 00	10 22 00 00	Folding Panel Partitions
10 22 19 00	10 22 00 00a	All-Glass Partitions
10 22 19 13	10 22 19 00	Demountable Partitions
10 22 19 13	10 22 00 00	Folding Panel Partitions
10 22 19 13	10 22 00 00a	All-Glass Partitions
10 22 19 43	10 22 19 00	Demountable Partitions
10 22 19 43	10 22 00 00	Folding Panel Partitions
10 22 19 43	10 22 00 00a	All-Glass Partitions
10 22 19 53	10 22 19 00	Demountable Partitions
10 22 19 53	10 22 00 00	Folding Panel Partitions
10 22 19 53	10 22 00 00a	All-Glass Partitions
10 22 23 00	10 22 00 00	Folding Panel Partitions
10 22 23 00	10 22 00 00a	All-Glass Partitions
10 22 23 13	10 22 00 00	Folding Panel Partitions
10 22 23 13	10 22 00 00a	All-Glass Partitions
10 22 23 23	10 22 19 00	Demountable Partitions
10 22 23 23	10 22 00 00	Folding Panel Partitions
10 22 23 23	10 22 00 00a	All-Glass Partitions



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SECTION 10 22 33 00 - ACCORDION FOLDING PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, accordion folding partitions.
2. Manually operated, fire-rated accordion folding partitions.
3. Electrically operated, accordion folding partitions.
4. Electrically operated, fire-rated accordion folding partitions.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.
2. Section 083513 "Folding Doors" for small-size, non-acoustically rated, fire-rated, and non-fire-rated accordion folding doors.

1.2 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 3. Product Data: For adhesives, indicating VOC content.
 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.



8. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
9. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For accordion folding partitions.

1. Include plans, elevations, sections, and attachment details.
2. Indicate storage and operating clearances.
3. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
4. Indicate facing-material seam locations if any.
5. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: For each type of exposed material, facing material, and finish indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed material, facing material, and finish indicated, prepared on Samples of size indicated below:

1. Textile Facing Material: Full width by not less than **36-inch- (914-mm-)** long section of **[fabric][carpet]** from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
2. Facing Material Other Than Textile: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
3. Edge Material: Not less than full width by **3 inches (75 mm)** long.
4. Hardware: Manufacturer's standard exposed door-operating device.

F. Delegated-Design Submittal: For seismic bracing of accordion folding partitions.

1. Include design calculations for seismic restraints that brace tracks to structure above.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Partition track, track supports[**and seismic bracing**], switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Access panels.
 - g. **<Insert item>**.
6. Plenum **[fire][smoke][and][acoustical]** barriers.

- B. Setting Drawings: For embedded items and cutouts required in other work[, **including support-beam, mounting-hole template**].
- C. Qualification Data: For **[manufacturer or vendor][Installer][and][testing agency]**.
- D. Product Certificates: For each type of accordion folding partition, from manufacturer.
- E. Material Certificates: For each textile dye lot, signed by manufacturers.
- F. Product Test Reports: For each accordion folding partition, for tests performed by a qualified testing agency.
- G. Field quality-control reports.
- H. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For accordion folding partitions to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Facing materials and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, carriers, and other operating components.
 - c. Electric operator and controls.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of accordion folding partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:



- a. Faulty operation of accordion folding partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.
3. Warranty Period for Pantographic Frames, Trolleys, and Tracks: **[10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic bracing of tracks to structure above, according to the seismic performance requirements.
- B. Seismic Performance: Accordion folding partitions shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
- C. Acoustical Performance: Provide accordion folding partitions tested by a qualified testing agency for the following acoustical properties, according to test methods indicated:
 1. Sound-Transmission Requirements: Accordion folding partition assembly tested in a laboratory for sound-transmission loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.
 2. Noise-Reduction Requirements: Accordion folding partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C423, and rated for not less than the NRC indicated.
 3. Noise-Isolation Requirements: Installed accordion folding partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E336, determined by ASTM E413, and rated for **[10 dB less than STC value indicated]<Insert value>**.
- D. Fire-Test-Response Characteristics: Provide partitions with finishes complying with one of the following, as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **[25]<Insert value>** or less.
 - b. Smoke-Developed Index: **[450]<Insert value>** or less.
 2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to **[NFPA 265 Method B Protocol][or][NFPA 286]**.
- E. Fire Resistance: Provide fire-rated accordion folding partitions complying with NFPA 80, based on testing according to UL 10B for fire-rated door assemblies.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a

qualified testing agency, and marked for intended location and application.

2.2 ACCORDION FOLDING PARTITION

- A. Accordion Folding Partition: Accordion folding frame with **[pantograph][or][hinged]** sections designed for horizontal extension and retraction, covered with decorative facing material, reinforced for hardware attachment, supported by overhead suspension system, and equipped with manufacturer's standard air-release method to prevent billowing.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Cornell; a CornellCookson company]**
 - b. **[KWIK-WALL Company]**
 - c. **[Moderco Inc]**
 - d. **[Modernfold, Inc]**
 - e. **[Won-Door Corporation]**
 - f. **[Woodfold Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cornell; a CornellCookson company]**
 - b. **[KWIK-WALL Company]**
 - c. **[Moderco Inc]**
 - d. **[Modernfold, Inc]**
 - e. **[Won-Door Corporation]**
 - f. **[Woodfold Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
- B. Partition Type: **[Single fixed-jamb partition][Single sliding-jamb partition][Bi-parting partition with fixed jambs][Bi-parting partition with sliding jambs][Double-end-post partition in one accordion section][Double-end-post partition in two accordion sections][As indicated on Drawings]<Insert description>** with the following hardware:
1. Lead Post Latching Hardware:
 - a. **[Latch on one side][Latch on one side with coin-slot release on opposite side][Latch on both sides]<Insert requirement>** secured to **[recessed jamb striker][surface jamb striker][meeting post striker]<Insert requirement>**.
 - b. Key-operated lock cylinder[, **keyed to master key system,**] operable from **[latch side][both sides]** of post.
 - c. Deadlock to receive cylinder, operable from **[latch side][both sides]** of post. See Section 087100 "Door Hardware" and Section 087111 "Door Hardware (Descriptive Specification)" for lock cylinder and keying requirements.
 2. Meeting Post: **[Attached][Floating]**, with meeting/closing arrangement as indicated on Drawings.
 3. Intermediate Post: For intersecting partition on **[one side][both sides]** of partition.
 4. Storage-End Hardware: **[Anchor post, secured to opening jamb][Sliding jamb within storage pocket][Same as lead post, secured to recessed jamb striker][Same as lead post, secured to surface jamb striker][Same as lead post, secured to fixed jamb on pocket door]<Insert**

requirement>.

5. Pendant Pull: Near top of lead post in addition to standard pull handle/latch **[for units more than 10 feet (3 m) high or 20 feet (6 m) wide, or both]<Insert requirement>.**
6. Foot Bolt: On **[lead][attached meeting][and][intermediate]** post(s) where indicated; secured to post without interference with seals.

C. STC: **[30][35][40][45]<Insert STC rating>.**

D. NRC: Not less than **[0.50][0.70][0.85]<Insert NRC rating>.**

E. Dimensions: Fabricate partitions to form an assembled system of dimensions indicated on Drawings and verified by field measurements.

1. Stack Width (Stored): Maximum **[8-1/2-inch (216-mm)][12-1/2-inch (318-mm)]<Insert dimension>** thickness from one side of the partition to the other.
2. Width When Extended: Maximum **[5-inch (127-mm)][7-inch (178-mm)]<Insert dimension>** thickness from one side of the partition to the other.
3. Total Stack Depth (Stored): Maximum **[38 inches (965 mm)]<Insert dimension>.**

F. Electric Controls: **[Remote-control station][Two remote-control stations][Obstruction-detection device][and][emergency release mechanism]<Insert item>.**

G. Facing Material: **[Carpet wall covering][Fabric][Vinyl-coated fabric][Vinyl film][Plastic laminate][Wood veneer][Paint][Owner-furnished material]<Insert material or requirement>.**

1. Color/Pattern: **[Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert manufacturer's name and designation for color and pattern>.**

2.3 FIRE-RATED ACCORDION FOLDING PARTITION

A. Fire-Rated Accordion Folding Partition: Accordion folding frame with pantograph sections designed for horizontal extension and retraction, covered with decorative facing material, reinforced for hardware attachment, supported by overhead suspension system, and equipped with manufacturer's standard air-release method to prevent billowing.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Won-Door Corporation]**
- b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Won-Door Corporation]**
- b. **<Insert manufacturer's name>**

B. Partition Type: **[Single sliding-jamb partition][Bi-parting partition with sliding jambs][As indicated on Drawings]<Insert description>** with the following hardware:

1. Lead Post Latching Hardware:
 - a. [Latch on one side][Latch on one side with coin-slot release on opposite side][Latch on both sides]<Insert requirement> secured to [recessed jamb striker]<Insert requirement>.
 - b. Key-operated lock cylinder[, keyed to master key system,] operable from [latch side][both sides] of post.
 - c. Deadlock to receive cylinder, operable from [latch side][both sides] of post. See Section 087100 "Door Hardware" and Section 087111 "Door Hardware (Descriptive Specification)" for lock cylinder and keying requirements.
2. Storage-End Hardware: [Sliding jamb within storage pocket]<Insert requirement>.
3. Pendant Pull: Near top of lead post in addition to standard pull handle/latch [for units more than 10 feet (3 m) high or 20 feet (6 m) wide, or both]<Insert requirement>.
4. Foot Bolt: On lead post; secured to post to avoid interference with seals.

C. Fire Rating: [3/4 hour][1 hour][1-1/2 hours][3 hours]<Insert fire rating>.

D. STC: [30][40][44]<Insert STC rating>.

E. NRC: Not less than <Insert NRC rating>.

F. Dimensions: Fabricate partitions to form an assembled system of dimensions indicated on Drawings and verified by field measurements.

1. Stack Width (Stored): Maximum [11-1/2-inch (292-mm)]<Insert dimension> thickness from one side of the partition to the other.
2. Width When Extended: Maximum [13-3/4-inch (349-mm)]<Insert dimension> thickness from one side of the partition to the other.
3. Total Stack Depth (Stored): Maximum [38 inches (965 mm)]<Insert dimension>.

G. Electric Controls: [Remote-control station][Two remote-control stations][Obstruction-detection device][and][emergency release mechanism]<Insert item>.

H. Facing Material: [Vinyl film][Paint]<Insert material or requirement>.

1. Color/Pattern: [Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert manufacturer's name and designation for color and pattern>.

2.4 COMPONENTS

- A. Posts and Seals: Provide types of posts and seals that produce accordion folding partitions complying with performance requirements.
 1. Posts: Steel or aluminum; formed with deep-nesting and interlocking interfaces and fabricated to ensure rigidity of accordion folding partition.
 2. Perimeter Seals: Manufacturer's standard vinyl, neoprene, or woven silica vertical seals, horizontal top and bottom seals, and closures for lead posts and jambs. [Seals and closures at fire-rated partitions shall be identical to products tested for fire rating indicated and shall form an effective smoke and draft seal.]
- B. Hardware: Manufacturer's standard manually operated pulls, latches, locks, and bolts as required to operate accordion folding partitions; with decorative, protective finish.
- C. Trim: Manufacturer's standard with decorative, protective finish.



- D. Tiebacks: As required to maintain accordion folding partitions in stacked position; with manufacturer's standard finish.

2.5 SUSPENSION SYSTEMS

- A. Tracks: Steel or aluminum, **[mounted directly to overhead structural support,][with adjustable steel hanger rods for overhead support,]** designed for operation, size, and weight of accordion folding partition indicated. Size track to support partition operation and storage without damage to suspension system, accordion folding partitions, or adjacent construction. Limit track deflection to no more than **0.10 inch (2.54 mm)** between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 - 1. Track: **[Surface mounted][Recessed]**.
 - a. Head Closure Trim: Integral with track for protecting overhead surfaces; **[with factory-applied, decorative, protective finish][primed for field finish]**.
 - b. Head Closure Trim and Track Channel Pocket: For protecting overhead surfaces and enclosing overhead track opening; **[with factory-applied, decorative, protective finish][primed for field finish]**.
- B. Carriers: Trolley system as required for size and weight of partition and for easy, quiet operation; with **[four-wheel][six-wheel][12-wheel][manufacturer's standard]** ball-bearing carriers at lead post and **[two-wheel][manufacturer's standard]** ball-bearing carriers at intermediate partition supports.
 - 1. Wheels: **[Nylon][Steel][Manufacturer's standard]**.
- C. Track Switches and Accessories: Manufacturer's standard switches as required for type of operation, storage, track configuration, and layout indicated.
- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
- E. Steel Finish: Factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.6 ELECTRIC OPERATORS

- A. Factory-assembled electric operation system of size and capacity recommended and provided by accordion folding partition manufacturer for partition specified; with electric motor and factory-prewired motor controls, speed reducer, chain drive, remote-control stations, control devices, and accessories required for operation. Include wiring from control stations to motor. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
- B. Comply with NFPA 70.
- C. Motor Electrical Characteristics:
 - 1. Horsepower: **[1/4][1/3][3/4][Manufacturer's standard]<Insert value>**.
 - 2. Volts: **[115][208]<Insert value>**.
 - 3. Phase: **[Single phase][Polyphase]**.
 - 4. Hertz: 60.
- D. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.

- E. Remote-Control Station: For partitions indicated, provide manufacturer's standard key-operated, constant-pressure, three-position control station labeled "Open," "Close," and "[Off][Stop]." Provide two keys per station.
- F. Obstruction-Detection Device: For partitions indicated, provide automatic safety sensor indicated that causes operator to immediately **[shut off motor][stop and reverse direction]**.
 - 1. Sensor Edge: Contact-pressure-sensitive safety edge along partition's leading edge.
- G. Limit Switches: Provide each partition with adjustable switches, interlocked with motor controls and set to automatically stop accordion folding partition at fully extended and fully stacked positions.
- H. Electric Interlock: Provide each partition with safety interlocks to prevent operation of accordion folding partition under the following conditions:
 - 1. On partition, to prevent operation when partition is extended and locked.
 - 2. On storage pocket door, to prevent partition operation if door is not in fully open position.
 - 3. On partitions, at location of convergence by another partition, to prevent operation if merging partitions are in place.
- I. Emergency Release Mechanism: For partitions indicated, provide quick disconnect-release of electric-motor drive system, permitting manual operation in event of operating failure.

2.7 WOOD MATERIALS, GENERAL

- A. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- B. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- C. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- D. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- E. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 - 1. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - 2. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - 5. Adhesives: Do not use adhesives that contain urea formaldehyde.

- F. Composite Wood Products: Products shall be made without urea formaldehyde.
- G. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- I. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- J. Composite Wood Products: Products shall be made without urea formaldehyde.

2.8 FACING MATERIALS

- A. Provide facing materials with appropriate backing that comply with indicated fire-test-response characteristics, and that are factory attached to accordion folding partitions with concealed fasteners.
 - 1. Factory-apply facing material free of air bubbles, wrinkles, blisters, and other defects; **[in one piece, seamless;][with vertical invisible seams complying with Shop Drawings for location;]** and with no gaps or overlaps. Tightly secure and conceal raw and selvage edges of facing material for finished appearance. Horizontal butted edges or seams are not permitted.
 - 2. Where facing material with **[directional or repeating patterns or directional weave][directional, repeating, or matching grain]** are indicated, mark facing-material top and attach facing material in same direction.
 - 3. Match facing pattern **72 inches (1830 mm)** above finished floor unless otherwise indicated.
- B. Carpet Wall Covering: Manufacturer's standard **[nonwoven, needle-punched carpet with fibers fused to backing]**, from same dye lot, treated to resist stains.
- C. Fabric: **[Manufacturer's standard fabric][100 percent polyolefin woven fabric]**<Insert fabric description>, from same dye lot, treated to resist stains.
- D. Vinyl-Coated Fabric: Manufacturer's standard mildew-resistant, washable, vinyl-coated fabric wall covering; complying with WA-101, **[Type II-Medium Duty][or][Type III-Heavy Duty]**; Class A.
 - 1. Total Weight: **<Insert weight>**.
 - 2. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.
- E. Vinyl Film: Manufacturer's standard vinyl film laminated to partition substrate.
- F. Plastic Laminate: High-pressure decorative laminate; NEMA LD 3, Grade HGS.
- G. Wood Veneer: Laminated to **[noncombustible][fire-retardant-treated wood]** core with moisture-resistant adhesive.

1. Wood Species and Finish: **[Match Architect's sample][As selected by Architect from manufacturer's full range][Cherry][Maple][Poplar][Red oak]<Insert species> with [transparent finish][transparent finish over stain][wood finish as specified in Section 099300 "Staining and Transparent Finishing."]<Insert finish>.**

H. Paint: Manufacturer's standard baked enamel.

I. Owner-Furnished Material: **<Insert description or requirement>.**

2.9 STORAGE POCKET DOORS

- A. Storage Pocket Door : Full height at end of partition runs to conceal stacked partition[; **of same materials, finish, construction, thickness, and acoustical qualities as partition**]**<Insert requirement>**; complete with operating hardware[**and acoustical seals at soffit, floor, and jambs**]. Hinges in finish to match other exposed hardware.

1. Manufacturer's standard method to secure storage pocket door in closed position.
2. Rim Lock, Key Operated: Key-operated lock cylinder[, **keyed to master key system,**] to secure storage pocket door in closed position. Include two keys per lock.
3. Rim Lock, Deadlock: Deadlock to receive cylinder, to secure storage pocket door in closed position. See **[Section 087100 "Door Hardware"]****[Section 087111 "Door Hardware (Descriptive Specification)"]** for lock cylinder and keying requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of accordion folding partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with accordion folding partition manufacturer's written installation instructions. Install accordion folding partitions level and plumb, with tight joints and uniform appearance, and free of deformation and surface and finish irregularities.
- B. Install accordion folding partitions[, **seismic bracing,**] and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- C. Broken, cracked, chipped, deformed, or unmatched sections are unacceptable.
- D. Broken, cracked, deformed, or unmatched seals or seals with gaps at butted ends are unacceptable.
- E. Light-Leakage Test: Illuminate one side of partition installation, and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.**[Perform test and make adjustments before NIC testing.]**



3.3 FIELD QUALITY CONTROL

- A. NIC Testing: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
 - 1. Testing Extent: Testing agency shall randomly select **[one]<Insert number>** accordion folding partition installation(s) for testing.
 - 2. Testing Methodology: Perform testing of installed accordion folding partition for noise isolation according to ASTM E336, determined by ASTM E413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.
- B. Accordion folding partitions will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust accordion folding partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts as recommended by manufacturer.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.
- C. Electrically Operated Partitions: Adjust electric interlocks to properly control partition operation.
- D. Verify that safety devices are properly functioning.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain accordion folding partitions.

END OF SECTION 10 22 33 00



Task	Specification	Specification Description
10 22 33 00	10 22 00 00	Folding Panel Partitions
10 22 33 00	10 22 00 00a	All-Glass Partitions
10 22 43 00	10 22 00 00	Folding Panel Partitions
10 22 43 00	10 22 00 00a	All-Glass Partitions



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SECTION 10 26 00 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall guards.
2. Impact-resistant handrails.
3. Corner guards.
4. End-wall guards.
5. Abuse-resistant wall coverings.
6. Door-edge protection.
7. Door-frame protection.
8. Door-hardware protection.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for [**steel angle corner guards**][**pipe guards**][and][**wheel guards**] .
2. Section 057300 "Decorative Metal Railings" for metal handrails without plastic bumpers.
3. Section 064023 "Interior Architectural Woodwork for solid-wood handrails, bumper rails, chair rails, or corner moldings without plastic bumpers.
4. [**Section 087100 "Door Hardware"**][**Section 087111 "Door Hardware (Descriptive Specification)"**] for metal and plastic protective trim units used for armor, kick, mop, and push plates.
5. Section 117300 "Patient Care Equipment" for patient bed locators.

1.2 ACTION SUBMITTALS

A. Product Data: For each specified system and assembly, including components and accessories.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls and listings for door protection items attached to fire-rated doors.

B. Shop Drawings: For each type of wall and door protection, indicating locations and extent.

1. Include plans, elevations, sections, and attachment details. [**Show handrail design and support spacing required to withstand structural loads.**]

C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated, in each color and texture specified.

1. Include Samples of accent strips and accessories to verify color selection.

D. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Wall Guards: **12 inches (300 mm)** long. Include examples of joinery, corners, **[end caps,][top caps,]** and field splices.
2. Impact-Resistant Handrails: **12 inches (300 mm)** long. Include examples of joinery, corners, and field splices.
3. Guards: For **[corner][and][end wall]** . **12 inches (300 mm)** long. Include example top caps.
4. Abuse-Resistant Wall Coverings: **6 by 6 inches (150 by 150 mm)** square.
5. Door Edging: **12 inches (300 mm)** long.
6. Door-Frame Protector: **12 inches (300 mm)** long.
7. Door-Knob and Door-Lever Protector: Full-size unit of each type.

E. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.
4. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
5. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each type of exposed plastic material, by a qualified testing agency.
- B. Product Test Reports: For each type of handrail.
- C. Sample Warranties: For specified special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product.
 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials [, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Wall-Guard Covers: Full-size plastic covers of maximum length equal to **[2]<Insert number>** percent of each type, color, and texture of cover installed, but no fewer than **[two, 96-inch- (2400-mm-)]<Insert number and size>** long units.
 2. Handrail Covers: Full-size plastic covers of maximum length equal to **[2]<Insert number>** percent of each type, color, and texture of cover installed, but no fewer than **[two, 96-inch- (2400-mm-)]<Insert number and size>** long units.
 3. Corner-Guard Covers: Full-size plastic covers of maximum length equal to **[2]<Insert number>** percent of each type, color, and texture of cover installed, but no fewer than **[two, 48-inch- (1200-mm-)]<Insert number and size>** long units.
 4. Mounting and Accessory Components: Amounts proportional to quantities of extra materials.

Package mounting and accessory components with each extra material.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than **70 deg F (21 deg C)** during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall and door protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of **70 deg F (21 deg C)**.
 - a. Store corner-guard covers in a vertical position.
 - b. Store **[wall-guard][and][handrail]** covers in a horizontal position.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall and door protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain wall and door protection products **[of each type]** from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in **[the United States Access Board's ADA-ABA Accessibility Guidelines][and][ICC A117.1]<Insert requirement>** .
- C. Structural Performance: Handrails, including attachment to building construction, must withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform load of **[50 lbf/ft. (0.73 kN/m)]<Insert requirement>** applied in any direction.

2. Concentrated load of **200 lbf (0.89 kN)** applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.

2.3 WALL GUARDS**A. Crash Rail :**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Babcock-Davis]**
 - b. **[Construction Specialties, Inc.]**
 - c. **[inpro Corporation]**
 - d. **[Koroseal Interior Products, LLC]**
 - e. **[Nystrom, Inc.]**
 - f. **[Pawling Corporation]**
 - g. **[The R.C. Musson Rubber Co.]**
 - h. **[Wallprotex]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Babcock-Davis]**
 - b. **[Construction Specialties, Inc.]**
 - c. **[inpro Corporation]**
 - d. **[Koroseal Interior Products, LLC]**
 - e. **[Nystrom, Inc.]**
 - f. **[Pawling Corporation]**
 - g. **[The R.C. Musson Rubber Co.]**
 - h. **[Wallprotex]**
 - i. **<Insert manufacturer's name>**
3. Type: Heavy-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.
4. Cover: Extruded, rigid plastic, minimum **0.100-inch (2.5-mm)** wall thickness; **[as follows:][in dimensions and profiles indicated on Drawings.]**
 - a. Profile: **[Flat][Convex]<Insert description>** .
 - 1) Dimensions: Nominal **[6 inches high by 1 inch deep (150 mm high by 25 mm deep)][8 inches high by 1 inch deep (200 mm high by 25 mm deep)]<Insert dimensions>** .
 - 2) Surface: **[Uniform][Uniform with coextruded accent inlay strip in contrasting color][Grooved]<Insert description>** .
 - a) Accent Inlay Strip: Nominal **[2 inches (50 mm)]<Insert dimension>** high by length of rail.
 - b. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and**

texture> .

5. Retainer:

- a. Continuous Retainer: Minimum **0.080-inch- (2.0-mm-)** thick, one-piece, extruded aluminum.
- b. Retainer Clips: Manufacturer's standard impact-absorbing clips designed for heavy-duty performance.

6. Bumper: Continuous, resilient bumper cushion(s).

7. End Caps and Corners: Prefabricated, injection-molded plastic; **[matching color][contrasting with color]<Insert color>** cover; field adjustable for close alignment with snap-on cover.

8. Accessories: Concealed splices and mounting hardware.

9. Mounting: **[Surface mounted directly to wall][Reveal mounted on bumper cushion(s)][Extended mounting on injection-molded plastic mounting brackets]** .

B. Bumper Rails:

1. Plastic Bumper Rail :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- 1) **[Babcock-Davis]**
- 2) **[Boston Group USA]**
- 3) **[Construction Specialties, Inc.]**
- 4) **[inpro Corporation]**
- 5) **[Koroseal Interior Products, LLC]**
- 6) **[Nystrom, Inc.]**
- 7) **[Pawling Corporation]**
- 8) **[Wallprotex]**
- 9) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Babcock-Davis]**
- 2) **[Boston Group USA]**
- 3) **[Construction Specialties, Inc.]**
- 4) **[inpro Corporation]**
- 5) **[Koroseal Interior Products, LLC]**
- 6) **[Nystrom, Inc.]**
- 7) **[Pawling Corporation]**
- 8) **[Wallprotex]**
- 9) **<Insert manufacturer's name>**

- c. Type: Standard-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.

- d. Cover: Extruded, rigid plastic, minimum **0.078-inch (2.0-mm)** wall thickness; **[as follows:][in dimensions and profiles indicated on Drawings.]**

- 1) Profile: **[Half-round profile, nominal 1 inch high by 1 inch deep (25 mm high by 25 mm deep)][Rounded bullnose profile, nominal 4 inches high by 2 inches**

- deep (100 mm high by 50 mm deep)][Angled profile with rounded bullnose front edge, nominal 4 inches high by 2 inches deep (100 mm high by 50 mm deep)][Flat profile, nominal 4 inches high by 1 inch deep (100 mm high by 25 mm deep)]<Insert profile and dimensions> .
- 2) Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .
- e. Retainer:
- 1) Continuous Retainer: Minimum **0.080-inch- (2.0-mm-)** thick, one-piece, extruded aluminum.
 - 2) Retainer Clips: Manufacturer's standard impact-absorbing clips.
- f. Bumper: Continuous, resilient bumper cushion(s).
- g. End Caps and Corners: Prefabricated, injection-molded plastic; **[matching color][contrasting with color]<Insert color>** cover; field adjustable for close alignment with snap-on cover.
- h. Accessories: Concealed splices and mounting hardware.
- i. Mounting: **[Surface mounted directly to wall][Reveal mounted on bumper cushions][Extended mounting on injection-molded plastic mounting brackets]** .
2. Wood Bumper Rail :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Construction Specialties, Inc.]**
 - 2) **[Koroseal Interior Products, LLC]**
 - 3) **[Pawling Corporation]**
 - 4) **[WallGuard.com]**
 - 5) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Construction Specialties, Inc.]**
 - 2) **[Koroseal Interior Products, LLC]**
 - 3) **[Pawling Corporation]**
 - 4) **[WallGuard.com]**
 - 5) **<Insert manufacturer's name>**
 - c. Type: Standard-duty assembly consisting of continuous sculpted, solid-wood rail, with continuous bumper insert installed in continuous recessed retainer.
 - d. Wood Rail: **[3-1/2 inches high by 7/8 inch deep (89 mm high by 22 mm deep)][5-1/2 inches high by 1-1/2 inches deep (140 mm high by 38 mm deep)][Size and profile indicated on Drawings]<Insert dimensions>** .
 - 1) Wood Species: **[Red oak][Maple][Ash][Beech]<Insert species>** .
 - 2) Finish: **[Clear][Stained]** .
 - 3) Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**

- e. Bumper: Extruded plastic, minimum **0.078-inch (2.0-mm)** wall thickness; **[as follows:]****[in dimensions and profiles indicated on Drawings.]**
 - 1) Profile: **[Half-round profile, nominal 2 inches high by 1 inch deep (50 mm high by 25 mm deep)]****[Small rounded profile, nominal 1-1/8 inches high by 1-1/8 inches deep (30 mm high by 30 mm deep)]****<Insert profile and dimensions> .**
 - 2) Color and Texture: **[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]****<Insert color and texture> .**
 - 3) End Caps and Corners: Prefabricated, injection-molded plastic; color matching bumper; field adjustable for close alignment with snap-on bumper.
 - f. Retainer: Minimum **0.0625-inch- (1.6-mm-)** thick, one-piece, extruded aluminum.
 - 1) Finish: **[Mill]****[Brass colored]** .
 - g. Accessories: Concealed splices and mounting hardware.
 - h. Mounting: Surface mounted directly to wall.
3. Transparent-Plastic Chair Rail : Consisting of clear polycarbonate plastic sheet.
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Commercial Corner Guards]**
 - 2) **[inpro Corporation]**
 - 3) **[WallGuard.com]**
 - 4) **[Wallprotex]**
 - 5) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Commercial Corner Guards]**
 - 2) **[inpro Corporation]**
 - 3) **[WallGuard.com]**
 - 4) **[Wallprotex]**
 - 5) **<Insert manufacturer's name>**
 - c. Height: **[3 inches (75 mm) nominal]****[4 inches (100 mm) nominal]****[As indicated on Drawings]****<Insert dimension> .**
 - d. Mounting: Surface mounted using flat-head countersunk screws through factory-drilled mounting holes.

2.4 IMPACT-RESISTANT HANDRAILS

A. Plastic, Impact-Resistant Handrails :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Babcock-Davis]
 - b. [Construction Specialties, Inc.]
 - c. [inpro Corporation]
 - d. [Koroseal Interior Products, LLC]
 - e. [Nystrom, Inc.]
 - f. [Pawling Corporation]
 - g. [The R.C. Musson Rubber Co.]
 - h. [WallGuard.com]
 - i. [Wallprotex]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Babcock-Davis]
 - b. [Construction Specialties, Inc.]
 - c. [inpro Corporation]
 - d. [Koroseal Interior Products, LLC]
 - e. [Nystrom, Inc.]
 - f. [Pawling Corporation]
 - g. [The R.C. Musson Rubber Co.]
 - h. [WallGuard.com]
 - i. [Wallprotex]
 - j. <Insert manufacturer's name>
3. Type: Manufacturer's standard assembly consisting of snap-on plastic cover installed over continuous retainer.
4. Cover: Minimum [0.078-inch- (2.0-mm-)][0.100-inch- (2.5-mm-)]<Insert dimension> thick, extruded, rigid plastic; [as follows:][in dimensions and profiles indicated on Drawings.]
- a. Single Handrail: Cylindrical tube profile cover with continuous retainer; with mounting brackets supporting bottom of rail.
 - 1) Tube Diameter: <Insert dimension> .
 - b. Bumper Rail: Cover with [flat][sculpted with contoured thumb recess on]<Insert description> front side; with 1-1/2-inch- (38-mm-) diameter, gripping surface and finger recess on back side; supported by concealed, continuous retainer and extended mounting brackets.
 - 1) Bumper-Rail Dimensions: Nominal [5-1/2 inches high by 1-1/2 inches deep (140 mm high by 38 mm deep)][5-1/2 inches high by 2 inches deep (140 mm high by 50 mm deep)]<Insert dimensions> .
 - 2) Bumper Surface: [Smooth][Smooth with coextruded accent inlay strip in contrasting color][Smooth with coextruded accent inlay strips in contrasting color][Grooved]<Insert description> .
 - 3) Accent Inlay Strip(s): [One strip][Two strips] , nominal [2 inches (50 mm)]<Insert dimension> high by length of rail.
 - c. Double Handrail with Bumper-Rail Profile: Two tubes mounted above and below nominal, flat-faced bumper rail; each tube with 1-1/2-inch- (38-mm-) diameter, gripping surface and

finger recess on back side; supported by concealed, continuous retainer and extended mounting brackets.

- 1) Bumper-Rail Dimensions: Nominal **[4 inches high by 1-1/2 inches deep (100 mm high by 38 mm deep)]<Insert dimensions>** .
- 2) Bumper Surface: **[Smooth][Smooth with coextruded accent inlay strip in contrasting color][Smooth with coextruded accent inlay strips in contrasting color][Grooved]<Insert description>** .
- 3) Accent Inlay Strip(s): **[One strip][Two strips]** , nominal **[2 inches (50 mm)]<Insert dimension>** high by length of rail.

- d. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>** .

5. Retainer: Minimum **0.080-inch- (2.0-mm-)** thick, one-piece, extruded aluminum.
6. Mounting Bracket: Extended mounting on **[injection-molded plastic][anodized-aluminum]<Insert description>** mounting brackets.
7. End Caps and Corners: Prefabricated, injection-molded plastic; **[matching color][contrasting with color]<Insert color>** cover; field adjustable for close alignment with snap-on cover.
8. Accessories: Concealed splices, cushions, and mounting hardware.

B. Combination Wood-Plastic Bumper Handrail :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Pawling Corporation]**
 - d. **[WallGuard.com]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Pawling Corporation]**
 - d. **[WallGuard.com]**
 - e. **<Insert manufacturer's name>**
3. Type: Manufacturer's standard assembly consisting of solid-wood handrail mounted above plastic bumper rail, both mounted on continuous retainer; with reveal between handrail and bumper serving as thumb recess on front side; with **1-1/2-inch- (38-mm-)** diameter, gripping surface and finger recess on back side.
4. Wood Handrail: **1-1/2 inches (38 mm)** in diameter; with matching end caps and corners.
 - a. Wood Species: **[Red oak][Maple][Ash][Beech]<Insert species>** .
 - b. Finish: **[Clear][Stained]** .
 - c. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .

5. Bumper: Extruded, rigid plastic, minimum **[0.078-inch- (2.0-mm-)]****[0.100-inch- (2.5-mm-)]** wall thickness; **[as follows:]****[in dimensions and profiles indicated on Drawings.]**
 - a. Profile: **[Flat]****[Convex]****<Insert profile>** profile, nominal **[4 inches high by 1 inch deep (100 mm high by 25 mm deep)]****<Insert profile and dimensions>** .
 - b. Accent Inlay Strip: Nominal **[2 inches (50 mm)]****<Insert dimension>** high by length of rail.
 - c. Color and Texture: **[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]****<Insert color and texture>** .
 - d. End Caps and Corners: Prefabricated, injection-molded plastic; color matching bumper; field adjustable for close alignment with snap-on bumper.
6. Retainer: Minimum **0.0625-inch- (1.6-mm-)** thick, one-piece, extruded aluminum.
7. Reveal: Extruded, rigid plastic over aluminum retainer.
 - a. Color: **[Brass]****[Chrome]****[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]****<Insert color>** .
8. Accessories: Concealed splices, cushion(s), and mounting hardware.

C. Wood Handrail with Bumper :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[inpro Corporation]**
 - b. **[Pawling Corporation]**
 - c. **[WallGuard.com]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[inpro Corporation]**
 - b. **[Pawling Corporation]**
 - c. **[WallGuard.com]**
 - d. **<Insert manufacturer's name>**
3. Type: Manufacturer's standard assembly consisting of continuous sculpted, solid-wood handrail, with bumper insert installed in continuous retainer recessed into the face of the wood.
4. Wood Handrail: **[As indicated on Drawings]****<Insert dimensions>** with **1-1/2-inch- (38-mm-)** diameter, gripping surface.
 - a. End Caps, Returns, Corners, and Mounting Brackets: Solid wood that matches rail.
 - b. Wood Species: **[Red oak]****[Maple]****[Ash]****[Beech]****[Bamboo]****<Insert species>** .
 - c. Finish: **[Clear]****[Stained]** .
 - d. Color: **[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]****<Insert color>** .
5. Bumper: Extruded plastic, minimum **0.078-inch (2.0-mm)** wall thickness; **[as follows:]****[in dimensions and profiles indicated on Drawings]** .

- a. Profile: **[Half-round profile, nominal 2 inches high by 1 inch deep (50 mm high by 25 mm deep)][Small rounded profile, nominal 1-1/8 inches high by 1-1/8 inches deep (30 mm high by 30 mm deep)]<Insert profile and dimensions>** .
 - b. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>** .
 - c. End Caps and Corners: Prefabricated, injection-molded plastic; color matching bumper; field adjustable for close alignment with snap-on bumper.
6. Retainer: Minimum **0.0625-inch- (1.6-mm-)** thick, one-piece, extruded aluminum.
 - a. Finish: **[Mill][Brass colored]** .
 7. Accessories: Concealed splices and mounting hardware.

2.5 CORNER GUARDS

A. Surface-Mounted Corner Guards:

1. Surface-Mounted, Plastic-Cover Corner Guards :
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Babcock-Davis]**
 - 2) **[Commercial Corner Guards]**
 - 3) **[Construction Specialties, Inc.]**
 - 4) **[inpro Corporation]**
 - 5) **[JL Industries; Activar Construction Products Group, Inc.]**
 - 6) **[Koroseal Interior Products, LLC]**
 - 7) **[Nystrom, Inc.]**
 - 8) **[The R.C. Musson Rubber Co.]**
 - 9) **[WallGuard.com]**
 - 10) **[Wallprotex]**
 - 11) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Babcock-Davis]**
 - 2) **[Commercial Corner Guards]**
 - 3) **[Construction Specialties, Inc.]**
 - 4) **[inpro Corporation]**
 - 5) **[JL Industries; Activar Construction Products Group, Inc.]**
 - 6) **[Koroseal Interior Products, LLC]**
 - 7) **[Nystrom, Inc.]**
 - 8) **[The R.C. Musson Rubber Co.]**
 - 9) **[WallGuard.com]**
 - 10) **[Wallprotex]**
 - 11) **<Insert manufacturer's name>**
 - c. Type: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover



- installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition
- d. Cover: Extruded, rigid plastic, minimum [0.078-inch (2.0-mm)][0.100-inch (2.5-mm)]<Insert dimension> wall thickness; [as follows:]<in dimensions and profiles indicated on Drawings.>
 - 1) Profile: Nominal [2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1-1/4-inch (32-mm) corner radius]<Insert dimensions> .
 - 2) Height: [4 ft. (1.2 m)][8 ft. (2.4 m)]<Insert dimension> .
 - 3) Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .
 - e. Retainer:
 - 1) Continuous Retainer: [Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum][One-piece, extruded plastic] .
 - 2) Retainer Clips: Manufacturer's standard impact-absorbing clips.
 - f. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
2. Surface-Mounted, Plastic Corner Guards :
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - 1) [Babcock-Davis]
 - 2) [Boston Group USA]
 - 3) [Construction Specialties, Inc.]
 - 4) [inpro Corporation]
 - 5) [JL Industries; Activar Construction Products Group, Inc.]
 - 6) [Koroseal Interior Products, LLC]
 - 7) [Nystrom, Inc.]
 - 8) [Pawling Corporation]
 - 9) [The R.C. Musson Rubber Co.]
 - 10) [WallGuard.com]
 - 11) [Wallprotex]
 - 12) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Babcock-Davis]
 - 2) [Boston Group USA]
 - 3) [Construction Specialties, Inc.]
 - 4) [inpro Corporation]
 - 5) [JL Industries; Activar Construction Products Group, Inc.]
 - 6) [Koroseal Interior Products, LLC]
 - 7) [Nystrom, Inc.]
 - 8) [Pawling Corporation]

- 9) [The R.C. Musson Rubber Co.]
 - 10) [WallGuard.com]
 - 11) [Wallprotex]
 - 12) <Insert manufacturer's name>
- c. Type: Fabricated as one piece from [plastic][acrylic-modified vinyl sheet][clear polycarbonate sheet][or][opaque polycarbonate sheet] ; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
- d. Wing Size: Nominal [3/4 by 3/4 inch (20 by 20 mm)][1-1/8 by 1-1/8 inches (30 by 30 mm)][2-1/2 by 2-1/2 inches (65 by 65 mm)]<Insert dimensions> .
- e. Mounting: [Countersunk screws through factory-drilled mounting holes][Adhesive] .
- f. Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .
3. Surface-Mounted, Metal Corner Guards :
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
- 1) [Babcock-Davis]
 - 2) [Boston Group USA]
 - 3) [Burns Manufacturing Incorporated]
 - 4) [Construction Specialties, Inc.]
 - 5) [inpro Corporation]
 - 6) [JL Industries; Activar Construction Products Group, Inc.]
 - 7) [Koroseal Interior Products, LLC]
 - 8) [Nystrom, Inc.]
 - 9) [Pawling Corporation]
 - 10) [WallGuard.com]
 - 11) [Wallprotex]
 - 12) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [Babcock-Davis]
 - 2) [Boston Group USA]
 - 3) [Burns Manufacturing Incorporated]
 - 4) [Construction Specialties, Inc.]
 - 5) [inpro Corporation]
 - 6) [JL Industries; Activar Construction Products Group, Inc.]
 - 7) [Koroseal Interior Products, LLC]
 - 8) [Nystrom, Inc.]
 - 9) [Pawling Corporation]
 - 10) [WallGuard.com]
 - 11) [Wallprotex]
 - 12) <Insert manufacturer's name>
- c. Type: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition
- d. Material:



- 1) Stainless steel sheet, **[Type 304][Type 430]** .
 - a) Thickness: Minimum **[0.0500 inch (1.3 mm)][0.0625 inch (1.6 mm)][0.0781 inch (2.0 mm)]<Insert dimension>** .
 - b) Finish: **[Directional satin, No. 4][Bright annealed]** .
- 2) Extruded aluminum, minimum **0.0625 inch (1.6 mm)** thick, with clear anodic finish.
- 3) Brass sheet, minimum **0.0500 inch (1.3 mm)** thick, with **[buffed, smooth specular][fine satin]** finish.
- e. Wing Size: Nominal **[1-1/2 by 1-1/2 inches (38 by 38 mm)][2-1/2 by 2-1/2 inches (65 by 65 mm)][3-1/2 by 3-1/2 inches (90 by 90 mm)]<Insert dimensions>** .
- f. Corner Radius: **[1/8 inch (3 mm)][3/4 inch (19 mm)]<Insert dimension>** .
- g. Mounting: **[Flat-head, countersunk screws through factory-drilled mounting holes][Oval head, countersunk screws through factory-drilled mounting holes][Adhesive]** .

B. Flush-Mounted Corner Guards:

1. Flush-Mounted, Plastic-Cover Corner Guards :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Commercial Corner Guards]**
 - 2) **[Construction Specialties, Inc.]**
 - 3) **[inpro Corporation]**
 - 4) **[Nystrom, Inc.]**
 - 5) **[Pawling Corporation]**
 - 6) **[WallGuard.com]**
 - 7) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Commercial Corner Guards]**
 - 2) **[Construction Specialties, Inc.]**
 - 3) **[inpro Corporation]**
 - 4) **[Nystrom, Inc.]**
 - 5) **[Pawling Corporation]**
 - 6) **[WallGuard.com]**
 - 7) **<Insert manufacturer's name>**
- c. Type: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface, installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.
- d. Cover: Extruded, rigid plastic, minimum **[0.078-inch (2.0-mm)][0.100-inch (2.5-mm)]<Insert dimension>** wall thickness; **[as follows:][in dimensions and profiles indicated on Drawings.]**
 - 1) Profile: Nominal **[2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-)**



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- 2) Corner Radius: [1/4 inch (6 mm)][1-1/4 inches (32 mm)] .
- 3) Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .
- f. Retainer: Minimum **0.070-inch- (1.8-mm-)** thick, one-piece, extruded aluminum.
- g. Aluminum Cove Base: Nominal [4 inches (100 mm)][6 inches (150 mm)]<Insert dimension> high.

2.6 END-WALL GUARDS

A. Surface-Mounted End-Wall Guards:

1. Surface-Mounted, Plastic-Cover, End-Wall Guard :

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - 1) [inpro Corporation]
 - 2) [Pawling Corporation]
 - 3) [WallGuard.com]
 - 4) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [inpro Corporation]
 - 2) [Pawling Corporation]
 - 3) [WallGuard.com]
 - 4) <Insert manufacturer's name>
- c. Type: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover installed over [continuous retainer][continuous retainer at each corner, with end of wall covered by semirigid, abuse-resistant wall covering] ; including mounting hardware.
- d. Cover: Extruded, rigid plastic, minimum [0.078-inch (2.0-mm)][0.100-inch (2.5-mm)] wall thickness; [as follows:][in dimensions and profiles indicated on Drawings.]
 - 1) Profile: Nominal [2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1-1/4-inch (32-mm) corner radius]<Insert dimensions> .
 - 2) Height: [4 ft. (1.2 m)][8 ft. (2.4 m)]<Insert dimension> .
 - 3) Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Match corner guards]<Insert color and texture> .
- e. Retainer: Minimum **0.060-inch- (1.5-mm-)** thick, one-piece, extruded aluminum.
- f. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2. Surface-Mounted, Metal, End-Wall Guards :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[American Floor Products Company, Inc]**
 - 2) **[WallGuard.com]**
 - 3) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[American Floor Products Company, Inc]**
 - 2) **[WallGuard.com]**
 - 3) **<Insert manufacturer's name>**
- c. Type: Fabricated from one-piece, formed or extruded metal that covers entire end of wall; with formed edges.
- d. Material:
 - 1) Stainless steel sheet, **[Type 304][Type 430]** .
 - a) Thickness: Minimum **[0.0500 inch (1.3 mm)][0.0625 inch (1.6 mm)][0.0781 inch (2.0 mm)]<Insert dimension>** .
 - b) Finish: **[Directional satin, No. 4][Bright annealed]** .
 - 2) Extruded aluminum, minimum **0.0625 inch (1.6 mm)** thick, with clear anodic finish.
 - 3) Brass sheet, minimum **0.0500 inch (1.3 mm)** thick, with **[buffed, smooth specular][fine satin]** finish.
- e. Wing Size: Nominal **[1-1/2 by 1-1/2 inches (38 by 38 mm)][2-1/2 by 2-1/2 inches (65 by 65 mm)][3-1/2 by 3-1/2 inches (90 by 90 mm)]<Insert dimensions>** .
- f. Corner Radius: **[1/8 inch (3 mm)][3/4 inch (19 mm)]<Insert dimension>** .
- g. Mounting: **[Flat-head, countersunk screws through factory-drilled mounting holes][Oval head, countersunk screws through factory-drilled mounting holes][Adhesive]** .

B. Flush-Mounted End-Wall Guards:

1. Flush-Mounted, Plastic-Cover, End-Wall Guard :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Construction Specialties, Inc.]**
 - 2) **[inpro Corporation]**
 - 3) **[Nystrom, Inc.]**
 - 4) **[Pawling Corporation]**
 - 5) **[WallGuard.com]**
 - 6) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of

the following:

- 1) **[Construction Specialties, Inc.]**
 - 2) **[inpro Corporation]**
 - 3) **[Nystrom, Inc.]**
 - 4) **[Pawling Corporation]**
 - 5) **[WallGuard.com]**
 - 6) **<Insert manufacturer's name>**
- c. Type: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface and that covers entire end of wall, installed over **[continuous retainer][continuous retainer at each corner, with end of wall covered by semirigid, abuse-resistant wall covering]** ; including mounting hardware.
- d. Cover: Extruded, rigid plastic, minimum **[0.078-inch (2.0-mm)][0.100-inch (2.5-mm)]<Insert dimension>** wall thickness; **[as follows:][in dimensions and profiles indicated on Drawings.]**
- 1) Profile: Nominal **[2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius][3-inch- (75-mm-) long leg and 1-1/4-inch (32-mm) corner radius]<Insert dimensions>** .
 - 2) Height: **[4 ft. (1.2 m)][8 ft. (2.4 m)]<Insert dimension>** .
 - 3) Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Match corner guards]<Insert color and texture>** .
- e. Retainer: Minimum **0.060-inch- (1.5-mm-)** thick, one-piece, extruded aluminum.
- f. Aluminum Cove Base: Nominal **[4 inches (100 mm)][6 inches (150 mm)]<Insert dimension>** high.
2. Fire-Rated, Flush-Mounted, Plastic-Cover, End-Wall Guard :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- 1) **[inpro Corporation]**
 - 2) **[Nystrom, Inc.]**
 - 3) **[Pawling Corporation]**
 - 4) **[WallGuard.com]**
 - 5) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[inpro Corporation]**
 - 2) **[Nystrom, Inc.]**
 - 3) **[Pawling Corporation]**
 - 4) **[WallGuard.com]**
 - 5) **<Insert manufacturer's name>**
- c. Type: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface and that covers entire end of wall, installed over continuous retainer and intumescent fire barrier; including mounting hardware; full wall

- height.
- d. Fire Rating: [1 hour][2 hours][Same rating as wall in which end guard is installed] ; UL listed and labeled in accordance with UL 2079.
- e. Cover: Extruded, rigid plastic, minimum [0.078-inch (2.0-mm)][0.100-inch (2.5-mm)]<Insert dimension> wall thickness; [as follows:][in dimensions and profiles indicated on Drawings.]
 - 1) Leg: Nominal [2 inches (50 mm)][3 inches (75 mm)]<Insert dimension> .
 - 2) Corner Radius: [1/4 inch (6 mm)][1-1/4 inches (32 mm)]<Insert dimension> .
 - 3) Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Match corner guards]<Insert color and texture> .
- f. Retainer: Minimum 0.070-inch- (1.8-mm-) thick, one-piece, extruded aluminum.
- g. Aluminum Cove Base: Nominal [4 inches (100 mm)][6 inches (150 mm)]<Insert dimension> high.

2.7 ABUSE-RESISTANT WALL COVERINGS

A. Abuse-Resistant Sheet Wall Covering : Fabricated from semirigid, plastic sheet wall-covering material.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Construction Specialties, Inc.]
 - b. [inpro Corporation]
 - c. [Koroseal Interior Products, LLC]
 - d. [Nystrom, Inc.]
 - e. [Pawling Corporation]
 - f. [WallGuard.com]
 - g. [Wallprotex]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Construction Specialties, Inc.]
 - b. [inpro Corporation]
 - c. [Koroseal Interior Products, LLC]
 - d. [Nystrom, Inc.]
 - e. [Pawling Corporation]
 - f. [WallGuard.com]
 - g. [Wallprotex]
 - h. <Insert manufacturer's name>
3. Size: [48 by 96 inches (1219 by 2438 mm) for sheet][48 by 120 inches (1219 by 3048 mm) for roll][As indicated]<Insert dimensions> .
4. Sheet Thickness: [0.022 inch (0.56 mm)][0.028 inch (0.7 mm)][0.040 inch (1.0 mm)][0.060 inch (1.5 mm)][0.080 inch (2.0 mm)][0.093 inch (2.4 mm)][0.125 inch (3.0 mm)]<Insert dimension> .
5. Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>

6. Height: **[Full wall][Wainscot][As indicated]<Insert dimension>** .
7. Trim and Joint Moldings: Extruded, rigid plastic that matches wall-covering color.
8. Mounting: Adhesive.

B. Rub Strip :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Commercial Corner Guards]**
 - b. **[Construction Specialties, Inc.]**
 - c. **[inpro Corporation]**
 - d. **[Koroseal Interior Products, LLC]**
 - e. **[Pawling Corporation]**
 - f. **[WallGuard.com]**
 - g. **[Wallprotex]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Commercial Corner Guards]**
 - b. **[Construction Specialties, Inc.]**
 - c. **[inpro Corporation]**
 - d. **[Koroseal Interior Products, LLC]**
 - e. **[Pawling Corporation]**
 - f. **[WallGuard.com]**
 - g. **[Wallprotex]**
 - h. **<Insert manufacturer's name>**
3. Type: Continuous strip, consisting of minimum **[0.040-inch- (1.0-mm-)][0.060-inch- (1.5-mm-)]<Insert dimension>** thick, semirigid, plastic sheet wall-covering material.
4. Height: **[8 inches (200 mm) nominal]<Insert dimension>** .
5. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>** .
6. Mounting: Surface mounting with adhesive.

2.8 DOOR-EDGE PROTECTION

A. Door Edging :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Koroseal Interior Products, LLC]**

- d. **[Pawling Corporation]**
 - e. **[WallGuard.com]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Koroseal Interior Products, LLC]**
 - d. **[Pawling Corporation]**
 - e. **[WallGuard.com]**
 - f. **<Insert manufacturer's name>**
3. Type: Fabricated from extruded, rigid plastic, minimum **[0.040-inch (1.0-mm)][0.060-inch (1.5-mm)]<Insert dimension>** wall thickness; formed to fit over door edge without mortising.
4. Shape: **[L][U]** .
5. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>** .
6. Mounting: **[Adhesive][Countersunk screws through factory-drilled mounting holes]** .

2.9 DOOR-FRAME PROTECTION

A. Door-Frame Protector Assembly :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Koroseal Interior Products, LLC]**
 - d. **[Pawling Corporation]**
 - e. **[WallGuard.com]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Construction Specialties, Inc.]**
 - b. **[inpro Corporation]**
 - c. **[Koroseal Interior Products, LLC]**
 - d. **[Pawling Corporation]**
 - e. **[WallGuard.com]**
 - f. **<Insert manufacturer's name>**
3. Type: Two-piece assembly consisting of snap-on plastic cover installed over continuous retainer; formed to fit half of door frame on opposite side of door swing.
4. Cover: Extruded, rigid plastic, minimum **0.080-inch (2.0-mm)** wall thickness; in dimensions and profiles indicated.

- a. Height: [36 inches (914 mm)][48 inches (1219 mm)]<Insert dimension> .
- b. Corner Radius: [1/4 inch (6 mm)][1-1/4 inches (32 mm)] .
- c. Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .

5. Retainer: Minimum **0.080-inch- (2.0-mm-)** thick, one-piece, extruded aluminum.

B. Door-Frame Protector :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Construction Specialties, Inc.]
 - b. [inpro Corporation]
 - c. [Koroseal Interior Products, LLC]
 - d. [Pawling Corporation]
 - e. [WallGuard.com]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Construction Specialties, Inc.]
 - b. [inpro Corporation]
 - c. [Koroseal Interior Products, LLC]
 - d. [Pawling Corporation]
 - e. [WallGuard.com]
 - f. <Insert manufacturer's name>
3. Type: One piece fabricated from extruded, rigid plastic, minimum [0.040-inch (1.0-mm)][0.050-inch (1.3-mm)][0.060-inch (1.5-mm)]<Insert dimension> wall thickness; formed to fit entire door-frame profile.
4. Height: [36 inches (914 mm)][48 inches (1219 mm)]<Insert dimension> .
5. Color and Texture: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture> .
6. Mounting: [Adhesive][Countersunk screws through factory-drilled mounting holes] .

2.10 DOOR-HARDWARE PROTECTION

A. Door-Knob and Door-Lever Protector :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Construction Specialties, Inc.]
 - b. [Pawling Corporation]
 - c. [WallGuard.com]

- d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Construction Specialties, Inc.]**
 - b. **[Pawling Corporation]**
 - c. **[WallGuard.com]**
 - d. **<Insert manufacturer's name>**
3. Type: **[Angled][Cupped]** protector fabricated from injection-molded plastic, minimum **0.060-inch (1.5-mm)** wall thickness.
4. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>**
5. Mounting: Countersunk screws through factory-drilled mounting holes.

2.11 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required; thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of **15 ft.-lbf/in. (800 J/m)** of notch when tested in accordance with ASTM D256, Test Method A.
- C. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.
 1. Certified Wood: Verify wood products are certified as "FSC Pure" [or "**FSC Mixed Credit**"] in accordance with FSC STD-01-001 and FSC STD-40-004.
 2. Certified Wood: Verify wood products are labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
 3. Certified Wood: Verify wood products are certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- E. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- F. Fasteners: Aluminum, nonmagnetic stainless steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

- G. Adhesive: As recommended in writing by protection product manufacturer.
1. Verify adhesives have a VOC content of [70]<Insert number> g/L or less.
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.12 FABRICATION OF WALL AND DOOR PROTECTION

- A. Fabricate wall and door protection in accordance with requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Curved Panels: Preform curved, semirigid, abuse-resistant sheet wall covering in factory for radius and sheet thickness as follows:
1. Sheet Thickness of 0.040 Inch (1.0 mm): **24-inch (610-mm)** radius.
 2. Sheet Thickness of 0.060 Inch (1.5 mm): **36-inch (914-mm)** radius.
- C. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- D. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- E. Wood Handrails: Miter corners and ends of wood handrails for returns.

2.13 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for

installation tolerances [, **fire rating,**] and other conditions affecting performance of the Work.

- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION OF WALL AND DOOR PROTECTION

- A. Install wall and door protection in accordance with manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings. [**If not indicated on Drawings, install at heights indicated below:**]
 - 1. Crash Rails: **<Insert dimension>** above finished floor.
 - 2. Bumper Rails: **<Insert dimension>** above finished floor.
 - 3. Handrails: **<Insert dimension>** above finished floor.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than **20 ft. (6.1 m)**, splice aluminum retainers and plastic covers at different locations along the run, but no closer than **12 inches (305 mm)** apart.
 - 3. Adjust **[end][and][top]** caps as required to ensure tight seams.
- D. Abuse-Resistant Wall Coverings: Install top and edge moldings, corners, and divider bars as required for a complete installation.
- E. Door-Frame Protectors: Install on both door jambs.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00 00



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Task	Specification	Specification Description
10 26 13 00	05 50 00 00	Metal Fabrications
10 26 13 00	10 26 00 00	Wall and Door Protection
10 26 16 00	10 26 00 00	Wall and Door Protection
10 26 16 13	10 26 00 00	Wall and Door Protection
10 26 16 16	10 26 00 00	Wall and Door Protection
10 26 23 00	10 26 00 00	Wall and Door Protection
10 26 23 13	10 26 00 00	Wall and Door Protection
10 26 41 00	10 26 00 00	Wall and Door Protection



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SECTION 10 28 00 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Toilet-compartment occupancy-indicator system.
3. Public-use shower room accessories.
4. Private-use bathroom accessories.
5. Healthcare accessories.
6. Childcare accessories.
7. Underlavatory guards.
8. Custodial accessories.
9. Hand-sanitizer dispensers.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.
2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath accessories.
3. Section 102813.63 "Detention Toilet Accessories" for accessories designed for installation in detention facilities.

1.2 ALLOWANCES

- A.** See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A.** See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A.** See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 COORDINATION

- A.** Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B.** Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 ACTION SUBMITTALS

- A. Product Data: For each product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.
- D. Delegated Design Submittals: For **[grab bars][and][shower seats]**.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: **[10][15]<Insert number>** years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Toilet-Compartment Occupancy-Indicator Systems: Manufacturer agrees to repair or replace toilet-compartment occupancy-indicator systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Two][Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

- A. Owner-Furnished Materials: **<Insert products>**.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
1. Grab Bars: Installed units are able to resist **250 lbf (1112 N)** concentrated load applied in any direction and at any point.
 2. Shower Seats: Installed units are able to resist **[250 lbf (1112 N)][360 lbf (1601 N)]<Insert load>** concentrated load applied in any direction and at any point.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain **[public-use washroom accessories][each type of public-use washroom accessory]** from single source from single manufacturer.
- B. Toilet Tissue (Roll) Dispenser :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - g. **[Seachrome Corporation]**
 - h. **[Tubular Specialties Manufacturing, Inc.]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - g. **[Seachrome Corporation]**
 - h. **[Tubular Specialties Manufacturing, Inc.]**
 - i. **<Insert manufacturer's name>**

3. Description: **[Roll-in-reserve dispenser with hinged front secured with tumbler lockset][Single-roll dispenser][Double-roll dispenser][Double-roll dispenser with shelf]<Insert description>**.
4. Mounting: **[Recessed][Partition mounted, serving two adjacent toilet compartments][Surface mounted]**.
5. Operation: **[Noncontrol delivery with standard spindle][Noncontrol delivery with theft-resistant spindle][Spindleless with tension-spring controlled delivery][Spindleless with tension-spring controlled delivery and self-locking device extending through core that prevents core removal until roll is empty][Eccentric-shaped, molded-plastic spindle revolves one-half revolution per dispensing operation for controlled delivery; core cannot be removed until roll is empty]<Insert description>**.
6. Capacity: Designed for **[4-1/2- or 5-inch- (114- or 127-mm-)][5-inch- (127-mm-)]<Insert dimension>** diameter tissue rolls.
7. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Chrome-plated zinc alloy (zamac) or steel][Satin-finish aluminum bracket with plastic spindle]<Insert material and finish>**.

C. Combination Toilet Tissue Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
3. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
 - b. Seat-cover dispenser with minimum capacity of **[500][1000]<Insert number>** single or half-fold seat covers.
4. Mounting: **[Recessed][Surface mounted][Partition mounted, dual access with two tissue rolls per compartment][Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment]**.
5. Toilet Tissue Dispenser Capacity: **[4-1/2- or 5-inch- (114- or 127-mm-)]<Insert dimension>** diameter tissue rolls.
6. Toilet Tissue Dispenser Operation: **[Noncontrol delivery with theft-resistant spindles]<Insert**

<description>.

7. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>.**
8. Lockset: Tumbler type.

D. Toilet Tissue (Jumbo-Roll) Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Description: **[One-roll unit][Two-roll unit with sliding panel to expose other roll].**
4. Mounting: Surface mounted.
5. Capacity: **[9- or 10-inch- (228- or 254-mm-)]<Insert dimension>** diameter rolls.
6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray, with translucent front cover]<Insert material and finish>.**
7. Lockset: Tumbler type.
8. Refill Indicator: Pierced slots at front.

E. Paper Towel (Folded) Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - g. **[Seachrome Corporation]**
 - h. **[Tubular Specialties Manufacturing, Inc.]**
 - i. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - g. **[Seachrome Corporation]**
 - h. **[Tubular Specialties Manufacturing, Inc.]**
 - i. **<Insert manufacturer's name>**
3. Mounting: **[Recessed][Semirecessed][Deck mounted, recessed][Surface mounted]**.
4. Minimum Capacity: **[400 C-fold or 525 multifold towels][600 C-fold or 800 multifold towels][400 single-fold towels]<Insert capacity>**.
5. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray]<Insert material and finish>**.
6. Lockset: Tumbler type.
7. Refill Indicator: Pierced slots at sides or front.

F. Paper Towel (Roll) Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
3. Description: **[Lever-actuated][Pull-towel-actuated]** mechanism that permits controlled delivery of paper rolls in preset lengths.
4. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
5. Minimum Capacity: **[8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll]<Insert capacity>**.
6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray, with translucent front cover]<Insert material and finish>**.
7. Lockset: Tumbler type.

G. Automatic Paper Towel (Roll) Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Description: Automatic motion-sensing mechanism with user-adjustable delay and paper towel length; **[electrically operated, with adapter for 110 to 240 V ac power supply][battery powered]<Insert description>**.
4. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
5. Minimum Capacity: **[8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll]<Insert capacity>**.
6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray]<Insert material and finish>**.
7. Lockset: Tumbler type.

H. Waste Receptacle :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**

- f. **[Tubular Specialties Manufacturing, Inc.]**
- g. **<Insert manufacturer's name>**
- 3. Mounting: **[Open top, recessed][Self-closing disposal-opening cover, recessed][Semirecessed][Surface mounted][Wall mounted for corner installation][Freestanding][Undercounter]<Insert description>**.
- 4. Minimum Capacity: **<Insert value>**.
- 5. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>**.
- 6. Liner: **[Reusable vinyl liner]<Insert liner description>**.
- 7. Lockset: Tumbler type for waste receptacle.

I. Countertop-Mounted Circular Waste Chute :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **<Insert manufacturer's name>**
- 3. OD: **[6 inches (152 mm)][7 inches (178 mm)][9 inches (229 mm)]<Insert dimension>**.
- 4. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>**.

J. Combination Towel (Folded) Dispenser/Waste Receptacle :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
3. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 4. Mounting: **[Surface mounted][Surface mounted with stainless steel collar][Recessed][Recessed with projecting receptacle][Semirecessed][Under vanity]<Insert mounting>**.
 - a. Designed for nominal **[4-inch (100-mm)][6-inch (150-mm)]** wall depth.
 5. Minimum Towel-Dispenser Capacity: **[600 C-fold or 800 multifold paper towels]<Insert capacity>**.
 6. Minimum Waste-Receptacle Capacity: **[4 gal. (15 L)][12 gal. (45.4 L)]<Insert value>**.
 7. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>**.
 8. Liner: **[Reusable, vinyl waste-receptacle liner]<Insert liner description>**.
 9. Lockset: Tumbler type for towel-dispenser compartment **[and waste receptacle]**.

K. Combination Towel (Roll) Dispenser/Waste Receptacle :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Tubular Specialties Manufacturing, Inc.]**
 - f. **<Insert manufacturer's name>**
3. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
4. Towel Mechanism: **[Lever][Pull towel][Automatic, electric sensor; with adapter for 110 to 240 V ac power supply][Automatic, battery-operated sensor]<Insert description>**.
5. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
6. Minimum Towel-Dispenser Capacity: **[8-inch- (203-mm-) wide, 800-foot- (244-m-) long]**

- roll]<Insert capacity>.
7. Minimum Waste Receptacle Capacity: [8 gal. (30 L)][12 gal. (45.4 L)][15 gal. (56.8 L)]<Insert value>.
8. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>.
9. Liner: [Reusable, vinyl waste-receptacle liner]<Insert liner description>.
10. Lockset: Tumbler type for towel dispenser compartment[and waste receptacle].

L. Multipurpose Soap/Towel Dispenser Unit :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bradley Corporation]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bradley Corporation]
 - c. <Insert manufacturer's name>
3. Description: Combination unit for dispensing soap in [liquid or lotion][lather] form and folded towels.
4. Mounting: [Recessed, designed for nominal 4-inch (100-mm) wall depth][Surface mounted with stainless steel collar and mirror]<Insert mounting>.
5. Minimum Soap-Dispenser Capacity: [80 oz. (2.36 L)]<Insert value>.
6. Minimum Towel-Dispenser Capacity: [600 C-fold or 800 multifold towels][1000 single-fold towels]<Insert capacity>.
7. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish> for unit body and soap valve.
8. Lockset: Tumbler type.

M. Warm-Air Hand Dryer :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Dryer, Inc]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Excel Dryer Inc.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Saniflow Corporation; Mediclinics S.A.]
 - h. [Sloan Valve Company]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. [World Dryer Corporation (Zurn Industries, LLC)]

- k. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Dryer, Inc]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Excel Dryer Inc.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Saniflow Corporation; Mediclinics S.A.]
 - h. [Sloan Valve Company]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. [World Dryer Corporation (Zurn Industries, LLC)]
 - k. <Insert manufacturer's name>
 3. Description: Standard-speed, warm-air hand dryer.
 4. Mounting: [Recessed][Semirecessed][Surface mounted].
 - a. Protrusion Limit: Installed unit protrudes maximum **4 inches (102 mm)** from wall surface.
 5. Operation: [Touch-button][Infrared-sensor] activated with timed power cutoff switch.
 - a. Automatic Shutoff: At [40][80][120]<Insert number> seconds.
 6. Maximum Sound Level: [63][67][87]<Insert number> dB.
 7. Cover Material and Finish: [Steel, with white enamel finish][Cast iron, with enamel finish in color selected by Architect][Chrome-plated steel][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Molded plastic, gray][Molded plastic, white]<Insert material and finish>.
 8. Electrical Requirements: [115 V, 13 A, 1500 W][115 V, 15 A, 1725 W][115 V, 20 A, 2300 W][208 to 240 V, 9 to 10 A, 1900 to 2300 W]<Insert requirements>.
- N. High-Speed Air Hand Dryer :
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Dryer, Inc]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Dyson Inc.]
 - f. [Excel Dryer Inc.]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Mitsubishi Electric US, Inc.]
 - i. [Saniflow Corporation; Mediclinics S.A.]
 - j. [Sloan Valve Company]
 - k. [Stern Engineering Ltd.]
 - l. [World Dryer Corporation (Zurn Industries, LLC)]
 - m. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[American Dryer, Inc]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Dyson Inc.]**
 - f. **[Excel Dryer Inc.]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Mitsubishi Electric US, Inc.]**
 - i. **[Saniflow Corporation; Mediclinics S.A.]**
 - j. **[Sloan Valve Company]**
 - k. **[Stern Engineering Ltd.]**
 - l. **[World Dryer Corporation (Zurn Industries, LLC)]**
 - m. **<Insert manufacturer's name>**
3. Description: High-speed, **[warm][unheated]**-air hand dryer for rapid hand drying.
 4. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
 - a. Protrusion Limit: Installed unit protrudes maximum **4 inches (102 mm)** from wall surface.
 5. Operation: Infrared-sensor activated with timed power cutoff switch.
 - a. Average Dry Time: **[12]<Insert number>** seconds.
 - b. Automatic Shutoff: At **[60]<Insert number>** seconds.
 6. Maximum Sound Level: **[69][75]<Insert number>** dB.
 7. Cover Material and Finish: **[Steel, with white enamel finish][Cast iron, with enamel finish in color selected by Architect][Chrome-plated steel][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Molded plastic, gray][Molded plastic, white]<Insert material and finish>**.
 8. Electrical Requirements: **[115 V, 13 A, 1500 W][115 V, 15 A, 1725 W][115 V, 20 A, 2300 W][208 to 240 V, 9 to 10 A, 1900 to 2300 W]<Insert requirements>**.

O. Multiple-Airflow Hand Dryer :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Dyson Inc.]**
 - d. **[Mitsubishi Electric US, Inc.]**
 - e. **[Saniflow Corporation; Mediclinics S.A.]**
 - f. **[World Dryer Corporation (Zurn Industries, LLC)]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**

- c. [Dyson Inc.]
 - d. [Mitsubishi Electric US, Inc.]
 - e. [Saniflow Corporation; Mediclinics S.A.]
 - f. [World Dryer Corporation (Zurn Industries, LLC)]
 - g. <Insert manufacturer's name>
3. Description: Multiple-airflow hand dryer, using two or more airstreams for rapid hand drying[**with heating unit on-off control**].
4. Mounting: [Surface mounted]<Insert requirements>.
5. Operation: Electronic-sensor activated with timed power cutoff switch.
- a. Average Dry Time: [12]<Insert number> seconds.
 - b. Automatic Shutoff: At [60]<Insert number> seconds.
6. Maximum Sound Level: [56][75]<Insert number> dB.
7. Water Collection: Removable reservoir.
8. Filter: HEPA, replaceable.
9. Cover Material and Finish: [Steel, with white enamel finish][Cast iron, with enamel finish in color selected by Architect][Chrome-plated steel][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Molded plastic, gray][Molded plastic, white]<Insert material and finish>.
10. Electrical Requirements: [115 V, 13 A, 1500 W][115 V, 15 A, 1725 W][115 V, 20 A, 2300 W][208 to 240 V, 9 to 10 A, 1900 to 2300 W]<Insert requirements>.

P. Soap Dispenser :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Seachrome Corporation]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Seachrome Corporation]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
3. Description: Designed for manual operation and dispensing soap in [liquid or lotion][lather] form.



4. Mounting: **[Deck mounted on vanity][Deck mounted on lavatory][Horizontally oriented, recessed][Horizontally oriented, surface mounted][Vertically oriented, surface mounted]<Insert mounting>.**
5. Capacity: **<Insert value>.**
6. Materials: **<Insert requirements>.**
7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

Q. Automatic Soap Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Advanced Modern Technologies Corporation - AMTC]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[GOJO Industries]**
 - f. **[Sloan Valve Company]**
 - g. **[Stern Engineering Ltd.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advanced Modern Technologies Corporation - AMTC]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[GOJO Industries]**
 - f. **[Sloan Valve Company]**
 - g. **[Stern Engineering Ltd.]**
 - h. **<Insert manufacturer's name>**
3. Description: Automatic dispenser with infrared sensor to detect presence of hands; **[electrically operated, with adapter for 110 to 240 V ac power supply][battery powered];** designed for dispensing soap in **[liquid or lotion][lather]** form.
4. Mounting: **[Deck mounted on vanity][Deck mounted on lavatory][Surface mounted].**
5. Capacity: **<Insert value>.**
6. Materials: **<Insert requirements>.**
7. Refill Indicator: LED indicator.
8. Low-Battery Indicator: LED indicator.

R. Grab Bar :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**

- c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Construction Solutions]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Oatey Co.]
 - i. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - j. [Seachrome Corporation]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Construction Solutions]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Oatey Co.]
 - i. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - j. [Seachrome Corporation]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
3. Mounting: Flanges with [concealed][exposed] fasteners.
4. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
- a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin)[on ends and slip-resistant texture in grip area].
5. OD: [1-1/4 inches (32 mm)][1-1/2 inches (38 mm)].
6. Configuration and Length: [As indicated on Drawings][Straight, 36 inches (914 mm) long]<Insert configuration and length>.
- S. Sanitary-Napkin and Tampon Vendor :
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - e. [Tubular Specialties Manufacturing, Inc.]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ASI-American Specialties, Inc.]
- b. [Bobrick Washroom Equipment, Inc]
- c. [Bradley Corporation]
- d. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
- e. [Tubular Specialties Manufacturing, Inc.]
- f. <Insert manufacturer's name>

- 3. Mounting: [Fully recessed, designed for 4-inch (100-mm) wall depth][Semirecessed][Surface mounted].
- 4. Capacity: <Insert description>.
- 5. Operation: [No coin (free)][Single coin (25 cents)][Two coins (50 cents)]<Insert description>.
- 6. Exposed Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>.
- 7. Lockset: Tumbler type with separate lock and key for coin box.

T. Sanitary-Napkin Disposal Unit :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
- 3. Mounting: [Recessed][Partition mounted, dual access][Surface mounted].
- 4. Door or Cover: Self-closing, disposal-opening cover[and hinged face panel with tumbler lockset].
- 5. Receptacle: Removable.
- 6. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray]<Insert material and finish>.

U. Seat-Cover Dispenser :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
3. Mounting: [Surface mounted][Recessed][Partition mounted, dual access].
4. Minimum Capacity: [250][500]<Insert number> seat covers.
5. Exposed Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)][ABS plastic, gray]<Insert material and finish>.
6. Lockset: Tumbler type.

V. Shelf :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]

g. <Insert manufacturer's name>

3. Description: [Fixed rectangular unit][Hinged unit with spring-loaded shelf that automatically returns to vertical position]<Insert description>.
4. Nominal Size: [15 inches (381 mm) long by 5-1/2 inches (140 mm) wide]<Insert dimensions>.
5. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Chrome-plated, cast-zinc alloy (zamac) with stippled finish on tray and bright chrome finish on edges]<Insert material and finish>.

W. Mirror Unit :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Seawin Hospitality; Seawin Global]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Seawin Hospitality; Seawin Global]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
3. Frame: [Stainless steel angle, 0.05 inch (1.3 mm) thick][Stainless steel channel][Stainless steel, fixed tilt][Stainless steel, adjustable tilt].
 - a. Corners: [Manufacturer's standard][Mitered and mechanically interlocked][Welded and ground smooth].
4. Size: [As indicated on Drawings]<Insert dimensions>.
5. Shelf:
 - a. Type: [Integral, welded][Concealed mounting][Exposed mounting].
 - b. Depth: [5 inches (127 mm)]<Insert dimension>.
6. Hangers: [Manufacturer's standard rigid, tamper and theft resistant]<Insert requirements>.

X. Hook :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Description: **[Double-prong unit][Single-prong unit][Combination hat and coat hook][Combination door bumper and coat hook]<Insert description>**.
4. Mounting: **[Concealed][Exposed]**.
5. Material and Finish: **[Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>**.

Y. Fixed-Height Adult Changing Station :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **<Insert manufacturer's name>**
3. Description: Horizontal unit that opens by folding down from stored position and with adjustable strap.

- a. Engineered to support minimum of **[400 lb (181 kg)]<Insert value>** static load when opened.
4. Mounting: **[Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed][Semirecessed, with unit projecting not more than 1 inch (25 mm) from wall when closed]**.
5. Operation: By pneumatic shock-absorbing mechanism.
6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners]<Insert requirements>**.
7. Liner Dispenser: Provide **[built-in][separate, locking]** dispenser for disposable sanitary liners.

Z. Adjustable-Height Adult Changing Station :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Pressalit Inc.]**
 - c. **[Smirthwaite USA LLC; Prism Medical Group]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Pressalit Inc.]**
 - c. **[Smirthwaite USA LLC; Prism Medical Group]**
 - d. **<Insert manufacturer's name>**
3. Description: Height-adjustable horizontal unit that is electrically operated with wired hand control and with safety rail **[and receiver tray][and receiver tray with integrated drain outlet]**.
 - a. Engineered to support minimum of **[300 lb (136 kg)][350 lb (159 kg)][400 lb (181 kg)]<Insert value>** static load when opened.
 4. Mounting: Surface mounted, foldable by pneumatic shock-absorbing mechanism.
 5. Electrical Characteristics: Manufacturer's standard actuator and control system, with integrated 24 V dc transformer, powered by single 120 V electrical receptacle.
 6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin), with PVC mattress]<Insert requirements>**.

2.4 TOILET-COMPARTMENT OCCUPANCY-INDICATOR SYSTEM

A. Toilet-Compartment Occupancy-Indicator System :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Tooshlights; Modus Systems, LLC (Sloan Valve Company)]**

- b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Tooshlights; Modus Systems, LLC (Sloan Valve Company)]**
 - b. **<Insert manufacturer's name>**
3. Description: Battery-powered latch and electrically powered indicator-light system. Latches communicate wirelessly with separate, overhead indicator lights.
4. Latch: Slide operation.
 - a. Compatibility: Provide latch compatible with compartment doors indicated for Project.
 - b. Power Source: Two AA batteries.
 - 1) Low-Battery Warning: Indicator light pulses when associated batteries of corresponding latch require replacement.
 - c. Patch Kit: Stainless steel in manufacturer's standard finish, adhesively applied to interior and exterior of compartment door to cover existing hardware locations.
 - d. Latch Material and Finish: Matte chrome-plated, die-cast zinc alloy (zamac); installed with stainless steel fasteners.
5. Indicator Light: Full-color, low-voltage, LED indicator that displays red when compartment door is latched, green when standard compartment door is unlatched, and blue when accessible compartment door is unlatched.
 - a. Traffic-Management-System Operation: Indicator lights also controlled by traffic management system for remote **[override of indicator light color][and][data collection from indicator lights]**.
 - b. Mounting: **[Ceiling, surface][Ceiling, semirecessed][Ceiling, pendant][Wall]** mounted.
 - c. Body Material and Finish: Satin white finish ABS plastic; installed with stainless steel fasteners.
 - d. Lens Material and Finish: **[Clear][Frosted]** acrylic.
 - e. Electrical Requirements: Provide indicator lights with dc adapters and that allow up to 30 lights to be powered by single 115 V, 20 A, electrical receptacle.

2.5 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain **[public-use shower room accessories][each type of public-use shower room accessory]** from single source from single manufacturer.
- B. Shower Curtain Rod :
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**

- f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
3. Description: [1-inch- (25.4-mm-)][1-1/4-inch- (32-mm-)] OD, straight rod.
4. Configuration: [As indicated on Drawings]<Insert description>.
5. Mounting Flanges: [Exposed][Concealed]<Insert requirements> fasteners; in [manufacturer's standard material and finish][material and finish matching rod]<Insert requirements>.
6. Rod Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Polished chrome-plated brass]<Insert material and finish>.

C. Shower Curtain :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
3. Size: Minimum [6 inches (152 mm)][12 inches (305 mm)] wider than opening by 72 inches (1829 mm) high.
4. Material: [Vinyl, minimum 0.006 inch (0.15 mm) thick, opaque, matte][Duck, minimum 8 oz. (227 g), white, 100 percent cotton][Nylon-reinforced vinyl, minimum 9 oz. (255 g) or 0.008-inch- (0.2-mm-) thick vinyl, with integral antibacterial and flame-retardant agents]<Insert material>.

5. Color: **[White][As selected from manufacturer's full range]<Insert color>**.
6. Grommets: Corrosion resistant at minimum **6 inches (152 mm)** o.c. through top hem.
7. Shower Curtain Hooks: **[Chrome-plated or stainless steel, spring wire curtain hooks with snap fasteners]<Insert description>**, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

D. Folding Shower Seat :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Configuration: **[L-shaped seat, designed for wheelchair access][Rectangular seat][Triangular, corner-type seat][Stainless steel seat designed to fold into recessed-mounted, stainless steel wall box]<Insert description>**.
4. Seat: **[Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect][White vinyl padded seat][Stainless steel, ASTM A480/A480M No. 4 finish (satin); 0.05-inch- (1.3-mm-) minimum nominal thickness; with single-piece, pan-type construction and edge seams welded and ground smooth]<Insert description>**.
5. Mounting Mechanism: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert description>**.
6. Dimensions: **<Insert dimensions>**.

E. Soap Dish :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**

- d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc.]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
3. Description: [Recessed][Surface] mounted, with the following features:
- a. Washcloth bar.
 - b. <Insert requirements>.
4. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>.

F. Robe Hook :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc.]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc.]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Seachrome Corporation]
 - g. [Tubular Specialties Manufacturing, Inc.]
 - h. <Insert manufacturer's name>

3. Description: [Double][Single]-prong unit.
4. Material and Finish: [Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.

2.6 PRIVATE-USE BATHROOM ACCESSORIES

- A. Source Limitations: Obtain [private-use bathroom accessories][each type of private-use bathroom accessory] from single source from single manufacturer.
- B. Private-Use Toilet Tissue Dispenser :
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Ginger; Brasstech, Inc.; Masco Corporation]
 - i. [Seachrome Corporation]
 - j. [Taymor Industries Ltd.]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Ginger; Brasstech, Inc.; Masco Corporation]
 - i. [Seachrome Corporation]
 - j. [Taymor Industries Ltd.]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
 3. Description: [Single][Double]-roll dispenser with the following features:
 - a. Hood.
 - b. <Insert requirements>.
 4. Mounting: [Recessed][Surface mounted].
 5. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.
 6. Material and Finish: [Solid brass, polished][Polished brass-plated zinc alloy

(zamac)][Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.

C. Private-Use Shower Curtain Rod :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Ginger; Brasstech, Inc.; Masco Corporation]
 - h. [Seachrome Corporation]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Ginger; Brasstech, Inc.; Masco Corporation]
 - h. [Seachrome Corporation]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. <Insert manufacturer's name>
3. Description: [1-inch- (25.4-mm-)][1-1/4-inch- (32-mm-)] OD, [straight][curved] rod.
4. Configuration: [As indicated on Drawings]<Insert description>.
5. Mounting Flanges: [Exposed][Concealed]<Insert requirements> fasteners; in [manufacturer's standard material and finish][material and finish matching rod]<Insert requirements>.
6. Rod Material and Finish: [Solid brass, polished][Polished chrome-plated brass][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.
7. Features: Integral chrome-plated brass glide hooks.

D. Private-Use Folding Shower Seat :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]

- c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Seachrome Corporation]**
 - g. **[Tubular Specialties Manufacturing, Inc.]**
 - h. **<Insert manufacturer's name>**
 3. Configuration: **[L-shaped seat, designed for wheelchair access][Rectangular seat][Triangular, corner-type seat][Stainless steel seat designed to fold into recessed-mounted, stainless steel wall box]<Insert description>**.
 4. Seat: **[Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect][White vinyl padded seat][Stainless steel, ASTM A480/A480M No. 4 finish (satin); 0.05-inch- (1.3-mm-) minimum nominal thickness; with single-piece, pan-type construction and edge seams welded and ground smooth]<Insert description>**.
 5. Mounting Mechanism: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert description>**.
 6. Dimensions: **<Insert dimensions>**.
- E. Private-Use Soap Dish :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Basco, Inc]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Ginger; Brasstech, Inc.; Masco Corporation]**
 - i. **[Seachrome Corporation]**
 - j. **[Taymor Industries Ltd.]**
 - k. **[Tubular Specialties Manufacturing, Inc.]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**

- b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Ginger; Brasstech, Inc.; Masco Corporation]
 - i. [Seachrome Corporation]
 - j. [Taymor Industries Ltd.]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
3. Description: <Insert description>.
 4. Mounting: [Recessed][Surface mounted].
 5. Material and Finish: [Solid brass, polished][Polished brass-plated zinc alloy (zamac)][Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.

F. Private-Use Medicine Cabinet :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Ketcham Medicine Cabinets & Accessories; Fred Silver & Company, Inc.]
 - h. [Seachrome Corporation]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Ketcham Medicine Cabinets & Accessories; Fred Silver & Company, Inc.]
 - h. [Seachrome Corporation]
 - i. [Tubular Specialties Manufacturing, Inc.]
 - j. <Insert manufacturer's name>
3. Mounting: [Recessed, for nominal 4-inch (100-mm) wall depth][Surface mounted].
4. Size: [18 by 24 inches (457 by 610 mm)]<Insert dimensions>.
5. Door: [Framed mirror door concealing storage cabinet equipped with continuous hinge and

- spring-buffered, rod-type stop and magnetic door catch]<Insert description>.**
6. Shelves: **[Three, adjustable]<Insert requirements>.**
 7. Material and Finish:
 - a. Cabinet: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Steel with corrosion-resistant finish].**
 - b. Mirror Frame: **<Insert material and finish>.**
 - c. Door: **<Insert material and finish>.**
 - d. Hinge: **<Insert material and finish>.**
 - e. Shelves: **<Insert material and finish>.**

G. Private-Use Facial Tissue Dispenser :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bobrick Washroom Equipment, Inc]**
 - e. **[Bradley Corporation]**
 - f. **[Brey-Krause Manufacturing Co.]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Seachrome Corporation]**
 - i. **[Taymor Industries Ltd.]**
 - j. **[Tubular Specialties Manufacturing, Inc.]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bobrick Washroom Equipment, Inc]**
 - e. **[Bradley Corporation]**
 - f. **[Brey-Krause Manufacturing Co.]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Seachrome Corporation]**
 - i. **[Taymor Industries Ltd.]**
 - j. **[Tubular Specialties Manufacturing, Inc.]**
 - k. **<Insert manufacturer's name>**
3. Mounting: **[Recessed][Surface mounted]<Insert requirements>.**
4. Depth: **[2-5/8 inches (67 mm)][4 inches (102 mm)]<Insert dimension>.**
5. Material and Finish:
 - a. Dispenser Face: **[Polished chrome-plated brass][Polished brass-plated zinc alloy (zamac)][Polished chrome-plated steel][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.**
 - b. Cabinet: **[Steel with corrosion-resistant finish]<Insert material and finish>.**

H. Private-Use Robe Hook :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bobrick Washroom Equipment, Inc]**
 - e. **[Bradley Corporation]**
 - f. **[Brey-Krause Manufacturing Co.]**
 - g. **[Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]**
 - h. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - i. **[Ginger; Brasstech, Inc.; Masco Corporation]**
 - j. **[Seachrome Corporation]**
 - k. **[Taymor Industries Ltd.]**
 - l. **[Tubular Specialties Manufacturing, Inc.]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bobrick Washroom Equipment, Inc]**
 - e. **[Bradley Corporation]**
 - f. **[Brey-Krause Manufacturing Co.]**
 - g. **[Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]**
 - h. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - i. **[Ginger; Brasstech, Inc.; Masco Corporation]**
 - j. **[Seachrome Corporation]**
 - k. **[Taymor Industries Ltd.]**
 - l. **[Tubular Specialties Manufacturing, Inc.]**
 - m. **<Insert manufacturer's name>**
3. Description: **[Double][Single]-prong unit.**
4. Material and Finish: **[Solid brass, polished][Polished brass-plated zinc alloy (zamac)][Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.**

I. Private-Use Toothbrush and Tumbler Holder :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Basco, Inc]**
 - c. **[Bradley Corporation]**

- d. [Brey-Krause Manufacturing Co.]
 - e. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Taymor Industries Ltd.]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - g. [Taymor Industries Ltd.]
 - h. [Tubular Specialties Manufacturing, Inc.]
 - i. <Insert manufacturer's name>
3. Description: <Insert description>.
4. Material and Finish: [Solid brass, polished][Polished brass-plated zinc alloy (zamac)][Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.

J. Private-Use Towel Bar :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Basco, Inc]
 - d. [Bobrick Washroom Equipment, Inc]
 - e. [Bradley Corporation]
 - f. [Brey-Krause Manufacturing Co.]
 - g. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - h. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - i. [Ginger; Brasstech, Inc.; Masco Corporation]
 - j. [Seachrome Corporation]
 - k. [Taymor Industries Ltd.]
 - l. [Tubular Specialties Manufacturing, Inc.]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Basco, Inc]
 - d. [Bobrick Washroom Equipment, Inc]

- e. [Bradley Corporation]
 - f. [Brey-Krause Manufacturing Co.]
 - g. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - h. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - i. [Ginger; Brasstech, Inc.; Masco Corporation]
 - j. [Seachrome Corporation]
 - k. [Taymor Industries Ltd.]
 - l. [Tubular Specialties Manufacturing, Inc.]
 - m. <Insert manufacturer's name>
3. Description: [3/4-inch- (19-mm-) square tube with rectangular end brackets][3/4-inch- (19-mm-) round tube with circular end brackets]<Insert description>.
 4. Mounting: Flanges with [concealed][exposed] fasteners.
 5. Length: [18 inches (457 mm)][24 inches (610 mm)][30 inches (762 mm)]<Insert dimension>.
 6. Material and Finish: [Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)][Polished aluminum]<Insert material and finish>.

K. Private-Use Towel Pin :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Basco, Inc]
 - d. [Bobrick Washroom Equipment, Inc]
 - e. [Bradley Corporation]
 - f. [Brey-Krause Manufacturing Co.]
 - g. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - h. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - i. [Ginger; Brasstech, Inc.; Masco Corporation]
 - j. [Seachrome Corporation]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Aluids; Krome USA Inc.]
 - b. [ASI-American Specialties, Inc.]
 - c. [Basco, Inc]
 - d. [Bobrick Washroom Equipment, Inc]
 - e. [Bradley Corporation]
 - f. [Brey-Krause Manufacturing Co.]
 - g. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - h. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - i. [Ginger; Brasstech, Inc.; Masco Corporation]
 - j. [Seachrome Corporation]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
3. Description: Projecting minimum of [3 inches (76 mm)][5 inches (127 mm)]<Insert dimension>

- from wall surface.
4. Material and Finish: **[Polished brass-plated zinc alloy (zamac)][Polished chrome-plated brass][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>**.
- L. Private-Use Towel Ring :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Ginger; Brasstech, Inc.; Masco Corporation]**
 - i. **[Seachrome Corporation]**
 - j. **[Taymor Industries Ltd.]**
 - k. **[Tubular Specialties Manufacturing, Inc.]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Basco, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]**
 - g. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - h. **[Ginger; Brasstech, Inc.; Masco Corporation]**
 - i. **[Seachrome Corporation]**
 - j. **[Taymor Industries Ltd.]**
 - k. **[Tubular Specialties Manufacturing, Inc.]**
 - l. **<Insert manufacturer's name>**
 3. Description: Pin projecting approximately **[2-1/2 inches (64 mm)]<Insert dimension>** from wall with **[square][circular][oval][trapezoidal]<Insert requirements>** ring.
 4. Pin Material and Finish: **[Solid brass, polished][Polished brass-plated zinc alloy (zamac)][Polished chrome-plated brass][Polished chrome-plated zinc alloy (zamac)][Stainless steel, ASTM A480/A480M No. 4 finish (satin)][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>**.
 5. Ring Material and Finish: **[Matching pin][Clear plastic]<Insert requirements>**.
- M. Private-Use Towel Shelf :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Ginger; Brasstech, Inc.; Masco Corporation]
 - i. [Seachrome Corporation]
 - j. [Taymor Industries Ltd.]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Basco, Inc]
 - c. [Bobrick Washroom Equipment, Inc]
 - d. [Bradley Corporation]
 - e. [Brey-Krause Manufacturing Co.]
 - f. [Franklin Brass; Liberty Hardware Manufacturing Corporation; Masco Corporation]
 - g. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - h. [Ginger; Brasstech, Inc.; Masco Corporation]
 - i. [Seachrome Corporation]
 - j. [Taymor Industries Ltd.]
 - k. [Tubular Specialties Manufacturing, Inc.]
 - l. <Insert manufacturer's name>
 3. Description: Surface-mounted, guest-towel shelf with [four]<Insert number> stainless steel tubes, [3/8 inch (10 mm) in diameter][5/16 inch (8 mm) square]<Insert requirements>, mounted in support arms.
 - a. Towel Bar: [1/4-inch- (6-mm-) diameter][5/16-inch- (8-mm-) square] stainless steel towel bar below shelf.
 4. Length: [18 inches (457 mm)][24 inches (610 mm)]<Insert dimension>.
 5. Material and Finish: [Polished brass-plated, stainless steel][Polished chrome-plated, stainless steel][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>.
- N. Private-Use Towel Rack :
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Aluids; Krome USA Inc.]
 - b. [Basco, Inc]
 - c. [Taymor Industries Ltd.]
 - d. [Tubular Specialties Manufacturing, Inc.]
 - e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aluids; Krome USA Inc.]**
 - b. **[Basco, Inc]**
 - c. **[Taymor Industries Ltd.]**
 - d. **[Tubular Specialties Manufacturing, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Description: **[Surface-mounted, guest-towel unit with approximately 1/4-inch- (6-mm-) diameter wire rings welded to upright wire bracket]<Insert description>**.
4. Capacity: **[Two][Three][Four]<Insert number>** sets of bath towels, hand towels, and washcloths.
5. Nominal Height: **[11 inches (279 mm)][17 inches (432 mm)][21 inches (533 mm)]<Insert dimension>**.
6. Material and Finish: **[Polished brass-plated zinc alloy (zamac)][Polished chrome-plated zinc alloy (zamac)]<Insert material and finish>**.

O. Private-Use Retractable Clothesline :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Basco, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Basco, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Description: Surface-mounted **[rectangular][circular]** housing with minimum **72-inch- (1829-mm-)** long, retractable, spring-actuated, synthetic clothesline and remote retention bracket.
4. Material and Finish **[Chrome-plated brass][Stainless steel, ASTM A480/A480M No. 7 finish (polished)]<Insert material and finish>**.

2.7 HEALTHCARE ACCESSORIES

- A. Source Limitations: Obtain **[healthcare accessories][each type of healthcare accessory]** from single source from single manufacturer.

B. Specimen Pass-Through Cabinet :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Carr Corporation]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Carr Corporation]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Description: **[Two-sided type, with self-closing, interlocking doors on both sides, that prevent both from being open at same time, and removable stainless steel tray][Turntable type, with minimum 12-inch- (305-mm-) diameter removable cylinder that revolves on stainless steel, self-lubricating, ball-bearing plates; with over-rotation prevention mechanism]<Insert description>.**
4. Nominal Wall Opening: **[12 by 11-1/4 inches (305 by 286 mm)][13-1/4 by 14 inches (337 by 356 mm)]<Insert dimensions>**, width by height.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
6. Lockset: Tumbler type.

C. Bedpan and Urinal Cabinet :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**

- c. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 3. Description: **[For storing one conventional-size bedpan and one urinal bottle; with door that produces 1/2-inch (13-mm) opening at top and bottom of cabinet to allow air circulation]<Insert requirements>**.
 - 4. Mounting: Recessed.
 - 5. Nominal Wall Opening: **[13-1/2 by 26-1/2 by 5 inches (343 by 673 by 127 mm)]<Insert dimensions>**, width by height by depth.
 - 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- D. Bedpan Rack :
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Tubular Specialties Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Tubular Specialties Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 3. Description: For storing **[one conventional-size bedpan][two conventional-size bedpans]**.
 - 4. Mounting: Surface mounted.
 - 5. Size: **[12 by 11 inches (305 by 279 mm)][12 by 27 inches (305 by 686 mm)]<Insert dimensions>**, width by height.
 - 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- E. Bedpan and Urinal Rack :
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - d. **[Tubular Specialties Manufacturing, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**

- d. **[Tubular Specialties Manufacturing, Inc.]**
- e. **<Insert manufacturer's name>**

- 3. Description: For storing one conventional-size bedpan and one urinal bottle.
- 4. Mounting: Surface mounted.
- 5. Size: **[12 by 27 inches (305 by 686 mm)]<Insert dimensions>**, width by height.
- 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.8 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain **[childcare accessories][each type of childcare accessory]** from single source from single manufacturer.

- B. Diaper-Changing Station :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[ASI-American Specialties, Inc.]**
- b. **[Bradley Corporation]**
- c. **[Diaper Deck & Co.]**
- d. **[Foundations Worldwide, Inc.]**
- e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
- f. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
- g. **[Safe-Strap Company, LLC]**
- h. **[Tubular Specialties Manufacturing, Inc.]**
- i. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[ASI-American Specialties, Inc.]**
- b. **[Bradley Corporation]**
- c. **[Diaper Deck & Co.]**
- d. **[Foundations Worldwide, Inc.]**
- e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
- f. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
- g. **[Safe-Strap Company, LLC]**
- h. **[Tubular Specialties Manufacturing, Inc.]**
- i. **<Insert manufacturer's name>**

- 3. Description: **[Horizontal][Vertical]** unit that opens by folding down from stored position and with child-protection strap.

- a. Engineered to support minimum of **[250 lb (113 kg)]<Insert value>** static load when opened.

- 4. Mounting: **[Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed][Semirecessed, with unit projecting not more than 1 inch (25 mm) from wall when closed]**.

- 5. Operation: By pneumatic shock-absorbing mechanism.

6. Material and Finish: **[HDPE in manufacturer's standard color][HDPE with plastic-laminate insert in color selected by Architect][Stainless steel, ASTM A480/A480M No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners][Stainless steel, ASTM A480/A480M No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color]<Insert requirements>.**
 7. Liner Dispenser: Provide **[built-in][separate, locking]** dispenser for disposable sanitary liners.
- C. Diaper-Changing Station Liner Dispenser :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - c. **<Insert manufacturer's name>**
 3. Mounting: Recessed.
 4. Minimum Capacity: **[100]<Insert number>** liners.
 5. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material and finish>.**
 6. Lockset: Tumbler type.
- D. Diaper-Pack Vendor :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foundations Worldwide, Inc.]**
 - b. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - c. **<Insert manufacturer's name>**
 3. Mounting: **[Surface mounted][Recessed].**
 4. Minimum Capacity: **[24]<Insert number>** diaper packs.
 5. Coin Operation: Coin slot preset for **[one U.S. dollar, adjustable up in 25-cent increments]<Insert requirements>.**
 6. Material and Finish: **[Stainless steel, ASTM A480/A480M No. 4 finish (satin)]<Insert material**

and finish>.

E. Child-Protection Seat :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Diaper Deck & Co.]**
 - d. **[Foundations Worldwide, Inc.]**
 - e. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - f. **[Safe-Strap Company, LLC]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Diaper Deck & Co.]**
 - d. **[Foundations Worldwide, Inc.]**
 - e. **[Koala Kare Products; Bobrick Washroom Equipment, Inc.]**
 - f. **[Safe-Strap Company, LLC]**
 - g. **<Insert manufacturer's name>**
3. Description: Unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support minimum of **[80 lb (36 kg)][150 lb (68 kg)]<Insert value>** static load when opened.
4. Mounting: Surface mounted, with unit projecting not more than **[4-1/2 inches (114 mm)][6 inches (152 mm)]** from wall when closed.
5. Material and Finish: **[HDPE in manufacturer's standard color]<Insert requirements>**.

2.9 UNDERLAVATORY GUARDS

A. Underlavatory Guard :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Buckaroos, Inc.]**
 - b. **[Plumberex Specialty Products, Inc.]**
 - c. **[Truebro; IPS Corporation]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Buckaroos, Inc.]**
 - b. **[Plumberex Specialty Products, Inc.]**
 - c. **[Truebro; IPS Corporation]**
 - d. **<Insert manufacturer's name>**
3. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 4. Material and Finish: Antimicrobial, molded plastic, white.

2.10 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain **[custodial accessories][each type of custodial accessory]** from single source from single manufacturer.

B. Custodial Utility Shelf :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bobrick Washroom Equipment, Inc]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Tubular Specialties Manufacturing, Inc.]**
 - g. **<Insert manufacturer's name>**
3. Description: With exposed edges turned down not less than **1/2 inch (13 mm)** and supported by two triangular brackets welded to shelf underside.
4. Size: **[16 inches (406 mm) long by 6 inches (152 mm) deep]<Insert dimensions>**.
5. Material and Finish: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Custodial Mop and Broom Holder :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASI-American Specialties, Inc.]
 - b. [Bobrick Washroom Equipment, Inc]
 - c. [Bradley Corporation]
 - d. [Brey-Krause Manufacturing Co.]
 - e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
 - f. [Tubular Specialties Manufacturing, Inc.]
 - g. <Insert manufacturer's name>
3. Description: [Unit with shelf, hooks, holders, and rod suspended beneath shelf]<Insert description>.
4. Length: [36 inches (914 mm)]<Insert dimension>.
5. Hooks: [Four]<Insert number>.
6. Mop/Broom Holders: [Three]<Insert number>, spring-loaded, rubber hat, cam type.
7. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
 - b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.

2.11 HAND-SANITIZER DISPENSERS

- A. Source Limitations: Obtain [hand-sanitizer dispensers][each type of hand-sanitizer dispenser] from single source from single manufacturer.
- B. Hand-Sanitizer Dispenser :
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [GOJO Industries]
 - b. [Rubbermaid Commercial Products]
 - c. [Tork; Essity Professional Hygiene North America LLC]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [GOJO Industries]
 - b. [Rubbermaid Commercial Products]
 - c. [Tork; Essity Professional Hygiene North America LLC]

- d. **<Insert manufacturer's name>**
3. Description: Manually operated dispenser[**with drip tray,**] designed for dispensing alcohol-based hand rub in **[gel][foam]** form. Designed to not release contents unless manually activated and to not dispense more hand rub than the amount required for hand hygiene consistent with label instructions.
4. Mounting: Wall mounted.
 - a. Protrusion Limit: Installed unit protrudes maximum **4 inches (102 mm)** from wall surface.
5. Capacity: **[24 oz. (700 mL)][34 oz. (1000 mL)][41 oz. (1200 mL)][68 oz. (2000 mL)]<Insert value>** maximum.
6. Materials: **[ABS plastic, white][ABS plastic, black][ABS plastic, dark gray]<Insert requirements>**.
7. Lockset: Tumbler type.
8. Refill Indicator: **[Window type][Translucent top][Translucent bottom]**.
- C. Automatic Hand-Sanitizer Dispenser :
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[GOJO Industries]**
 - b. **[Rubbermaid Commercial Products]**
 - c. **[SWIE Industries LLC]**
 - d. **[Tork; Essity Professional Hygiene North America LLC]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[GOJO Industries]**
 - b. **[Rubbermaid Commercial Products]**
 - c. **[SWIE Industries LLC]**
 - d. **[Tork; Essity Professional Hygiene North America LLC]**
 - e. **<Insert manufacturer's name>**
 3. Description: Automatic, battery powered dispenser with[**drip tray, and**] infrared sensor designed to detect presence of hands and dispense alcohol-based hand rub in **[gel][foam]** form. Designed to not release contents unless activated and to not dispense more hand rub than the amount required for hand hygiene consistent with label instructions. Designed for activation to only occur when an object is placed within **4 inches (102 mm)** of sensing device and so that an object placed and left within the activation zone will not cause more than one activation.
 4. Mounting: **[Wall mounted][Floor stand]**.
 - a. Protrusion Limit: Installed unit protrudes maximum **4 inches (102 mm)** from wall surface.
 5. Capacity: **[34 oz. (1000 mL)][41 oz. (1200 mL)]<Insert value>** maximum.
 6. Materials: **[ABS plastic, white][ABS plastic, black][ABS plastic, dark gray]<Insert requirements>**.
 7. Refill Indicator: **[LED indicator][Window type][Translucent top][Translucent bottom]**.
 8. Low-Battery Indicator: LED indicator.

2.12 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.031-inch- (0.8-mm-)** minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.
- C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), **0.036-inch- (0.9-mm-)** minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653/A653M, with **G60 (Z180)** hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.13 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [six]<Insert number> keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.



- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 10 28 00 00



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Task	Specification	Specification Description
10 28 13 00	01 11 19 00	No Specification Required
10 28 13 00	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 13 13	01 11 19 00	No Specification Required
10 28 13 13	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 13 13	10 28 13 63	Detention Toilet Accessories



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SECTION 10 28 13 63 - DETENTION TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Safety hooks.
2. Shelves.
3. Combination shelves with safety hooks.
4. Miscellaneous toilet accessories.
5. Stainless-steel mirrors.
6. Grab bars.
7. Shower seats.

B. Related Requirements:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for nondetention toilet accessories.

1.2 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B. Coordinate installation of anchorages for detention toilet accessories. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjoining construction. Deliver such items to Project site in time for installation.
- C. Coordinate size and location of recesses in wall construction to receive recessed detention toilet accessories.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]**<Insert location>.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.



2. Product Data: For sealants, indicating VOC content.
3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples for Verification: For each type of detention toilet accessory indicated.

1. Approved full-size Samples will be returned and may be used in the Work.

D. Product Schedule: For detention toilet accessories. Indicate types, quantities, sizes, and installation locations by room of each accessory required. [**Use same designations indicated on Drawings.**]

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Location of each built-in anchor supporting detention toilet accessories, including anchors to be installed as work of other Sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Locations, dimensions, and profiles of wall and floor reinforcements.
2. Locations and installation details of built-in anchors.
3. Elevations of each detention toilet accessory showing dimensions of accessory, preparations for receiving anchors, and locations of anchorage.
4. Details of attachment of each detention toilet accessory to built-in anchors.

B. Examination reports documenting inspection of substrates, areas, and conditions.

C. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

D. Field quality-control certification signed by Contractor[**and Detention Specialist**].

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For detention toilet accessories to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed.
2. Tools: Provide [**two**]**<Insert number>** sets of tools for installing and removing security fasteners.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace detention toilet accessories that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including deflection exceeding **1/4 inch (6.3 mm)**.

- b. Faulty operation of hardware.
 - c. Deterioration of metals, metal finishes, and other materials.
 - d. **<Insert failure modes>**.
2. Warranty Period: **[Two]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DETENTION SAFETY HOOKS

- A. Individual, Curved, Detention Safety Hook: **0.188-inch (4.77-mm)** nominal-thickness, stainless-steel curved hook held by **[0.141-inch- (3.58-mm-)]****[0.109-inch- (2.77-mm-)]** thick, stainless-steel bracket punched with not less than two holes for fastening with security fastener. Provide friction washer assembly, adjustable with a nonremovable security screw that maintains pressure on hook and allows hook to pivot when load exceeds preset limit indicated in Part 3.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Jail Products L.L.C.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Maximum Security Products Corp]**
 - e. **[PSI LLC]**
 - f. **[Willo Products Company, Inc.]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Maximum Security Products Corp]**
 - e. **[PSI LLC]**
 - f. **[Willo Products Company, Inc.]**
 - g. **<Insert manufacturer's name>**
- B. Individual, Straight, Detention Safety Hook: **[3/8-inch- (9.5-mm-)]****[1/4-inch- (6.3-mm-)]** diameter, stainless-steel straight hook held by **[0.109-inch- (2.77-mm-)]****[0.078-inch- (1.98-mm-)]** thick, stainless-steel mounting plate approximately **4 inches (102 mm)** square. Provide pivoting assembly that maintains pressure on hook and snaps down when load exceeds **[8 lbf (35.6 N)]****[15 lbf (66.7 N)]****[20 lbf (89.0 N)]****<Insert load>**.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**



- c. [Bobrick Washroom Equipment, Inc]
- d. [Bradley Corporation]
- e. [Brey-Krause Manufacturing Co.]
- f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
- g. [Maximum Security Products Corp]
- h. [Norix Group, Inc.]
- i. [PSI LLC]
- j. [Southern Folger Detention Equipment Company]
- k. [Willoughby Industries, Inc.]
- l. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Acorn Engineering Company; a Division of Morris Group International]
- b. [ASI-American Specialties, Inc.]
- c. [Bobrick Washroom Equipment, Inc]
- d. [Bradley Corporation]
- e. [Brey-Krause Manufacturing Co.]
- f. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
- g. [Maximum Security Products Corp]
- h. [Norix Group, Inc.]
- i. [PSI LLC]
- j. [Southern Folger Detention Equipment Company]
- k. [Willoughby Industries, Inc.]
- l. <Insert manufacturer's name>

3. Mounting: [Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate].

- C. Multiple, Curved, Safety Hook Strip: Minimum 5-1/2-inch- (140-mm-) high backplate by length indicated, formed from [0.125-inch- (3.18-mm-)][0.109-inch- (2.77-mm-)][0.078-inch- (1.98-mm-)] thick, stainless-steel sheet. Provide 0.188-inch- (4.77-mm-) thick, stainless-steel hooks attached to backplate; with each hook having a friction washer assembly, adjustable with a nonremovable security screw that maintains pressure on hook and allows hook to pivot when load exceeds preset limit indicated in Part 3.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ASI-American Specialties, Inc.]
- b. [Bradley Corporation]
- c. [PSI LLC]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ASI-American Specialties, Inc.]
- b. [Bradley Corporation]
- c. [PSI LLC]

- d. **<Insert manufacturer's name>**
 3. Configuration: **[16 inches (406 mm) long with two hooks][18 inches (457 mm) long with four hooks][21 inches (533 mm) long with four hooks][24 inches (610 mm) long with three hooks][32 inches (813 mm) long with four hooks]<Insert length and number of hooks>**.
 4. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate]**.
- D. Multiple, Straight, Safety Hook Strip: Minimum **5-1/2-inch- (140-mm-)** high backplate by length indicated, formed from **[0.141-inch- (3.58-mm-)][0.109-inch- (2.77-mm-)][0.078-inch- (1.98-mm-)]** thick, stainless-steel sheet. Provide **[3/8-inch- (9.5-mm-)][1/4-inch- (6.3-mm-)]** diameter, stainless-steel straight hooks attached to backplate. Provide pivoting assembly that maintains pressure on hook and snaps down when load exceeds **[8 lbf (35.6 N)][15 lbf (66.7 N)][20 lbf (89.0 N)]<Insert load>**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Norix Group, Inc.]**
 - g. **[PSI LLC]**
 - h. **[Willoughby Industries, Inc.]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Brey-Krause Manufacturing Co.]**
 - f. **[Norix Group, Inc.]**
 - g. **[PSI LLC]**
 - h. **[Willoughby Industries, Inc.]**
 - i. **<Insert manufacturer's name>**
 3. Configuration: **[16 inches (406 mm) long with two hooks][18 inches (457 mm) long with four hooks][24 inches (610 mm) long with three hooks][32 inches (813 mm) long with four hooks]<Insert length and number of hooks>**.
 4. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate]**.
- E. Materials:
1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

F. Stainless-Steel Finish:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.

2.2 DETENTION SHELVES

- A. Surface-Mounted, Steel Detention Shelf: Minimum **6 inches high by 8 inches (152 mm high by 203 mm)** deep by **[16 inches (406 mm)][24 inches (610 mm)][32 inches (813 mm)]<Insert dimension>** long; formed from **[0.138-inch (3.50-mm)][0.108-inch (2.74-mm)]** nominal-thickness, metallic-coated steel sheet; with welded side gussets and minimum **1-inch (25.4-mm)** flanged front edge; with back punched for fastening to wall with security fasteners.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**

- B. Surface-Mounted, Stainless-Steel Detention Shelf: Minimum **5-1/2 inches high by 8 inches (140 mm high by 203 mm)** deep by **[18 inches (457 mm)][24 inches (610 mm)]<Insert dimension>** long; formed from **0.078-inch- (1.98-mm-)** thick, stainless-steel sheet; with welded side gussets and hemmed front edge.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[American Jail Products L.L.C.]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[American Jail Products L.L.C.]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **<Insert manufacturer's name>**
 3. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate].**
- C. Recessed, Stainless-Steel Detention Shelf: Minimum inside dimensions of **[16 inches (406 mm)]<Insert dimension>** wide by **5 inches high by 4 inches (127 mm high by 102 mm)** deep; formed from **0.062-inch- (1.57-mm-)** thick, stainless-steel sheet; with **1-inch- (25.4-mm-)** wide flanged front edge. Secure to wall with rear-mounting steel strap and adjustment bolts.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Willoughby Industries, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Willoughby Industries, Inc.]**
 - g. **<Insert manufacturer's name>**
- D. Materials:
1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) coating designation.
 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- E. Finishes:
1. Metallic-Coated Steel Sheet Finish:

- a. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- b. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the coating to be applied over it.
- c. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.

- 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2. Stainless-Steel Finish:

- a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 4.

2.3 COMBINATION DETENTION SHELVES WITH SAFETY HOOKS

- A. Steel Detention Shelf with Multiple, Curved Safety Hooks: Minimum **6 inches high by 8 inches (152 mm high by 203 mm)** deep by length indicated, formed from **[0.138-inch (3.50-mm)][0.108-inch (2.74-mm)]** nominal-thickness, metallic-coated steel sheet, with welded side gussets and hemmed or flanged front edge. Provide **0.138-inch (3.50-mm)** nominal-thickness, zinc-plated-steel curved hooks held by **0.1265-inch- (3.21-mm-)** thick steel brackets welded to backplate, with each hook having a friction washer assembly, adjustable with a nonremovable security screw that maintains pressure on hook and allows hook to pivot when load exceeds preset limit indicated in Part 3.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**

- d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Configuration: **[16 inches (406 mm) long with two hooks][24 inches (610 mm) long with three hooks][32 inches (813 mm) long with four hooks]<Insert length and number of hooks>**.
 4. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate]**.
- B. Stainless-Steel Detention Shelf with Multiple, Curved Safety Hooks: Minimum 5-1/2 inches high by 8 inches (140 mm high by 203 mm) deep by length indicated; formed from 0.078-inch- (1.98-mm-) thick, stainless-steel sheet; with welded side gussets and hemmed or flanged front edge. Provide 0.141-inch (3.58-mm) stainless-steel curved hooks held by 0.141-inch- (3.58-mm-) thick, stainless-steel brackets welded to backplate, with each hook having a friction washer assembly, adjustable with a nonremovable security screw that maintains pressure on hook and allows hook to pivot when load exceeds preset limit indicated in Part 3.**
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Sweeper Metal Fabricators Corp]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Sweeper Metal Fabricators Corp]**
 - d. **<Insert manufacturer's name>**
 3. Configuration: **[16 inches (406 mm) long with two hooks][18 inches (457 mm) long with four hooks][24 inches (610 mm) long with three hooks][32 inches (813 mm) long with four hooks]<Insert length and number of hooks>**.
 4. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate]**.
- C. Stainless-Steel Detention Shelf with Multiple, Straight Safety Hooks: Minimum 5-1/2 inches high by 8 inches (140 mm high by 203 mm) deep by length indicated; formed from 0.078-inch- (1.98-mm-) thick, stainless-steel sheet; with welded side gussets and hemmed or flanged front edge. Provide [3/8-inch- (9.5-mm-)][1/4-inch- (6.3-mm-)] diameter, stainless-steel straight hooks held by [0.109-inch- (2.77-mm-)][0.078-inch- (1.98-mm-)] thick, stainless-steel mounting plate. Provide pivoting assembly that maintains pressure on hook and snaps down when load exceeds [8 lbf (35.6 N)][15 lbf (66.7 N)][20 lbf (89.0 N)]<Insert load>**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**

- c. [Norix Group, Inc.]
- d. [PSI LLC]
- e. [Willoughby Industries, Inc.]
- f. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Acorn Engineering Company; a Division of Morris Group International]
- b. [ASI-American Specialties, Inc.]
- c. [Norix Group, Inc.]
- d. [PSI LLC]
- e. [Willoughby Industries, Inc.]
- f. <Insert manufacturer's name>

- 3. Configuration: [16 inches (406 mm) long with two hooks][18 inches (457 mm) long with four hooks][24 inches (610 mm) long with three hooks][32 inches (813 mm) long with four hooks]<Insert length and number of hooks>.
- 4. Mounting: [Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate].

D. Materials:

- 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) coating designation.
- 3. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.

E. Finishes:

1. Steel Finish:

- a. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with [SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"] [or] [SSPC-SP 8, "Pickling"]<Insert surface preparation method>.[After cleaning, apply a conversion coating suited to the organic coating to be applied over it.]
 - b. Galvanizing: After fabrication, galvanize window components by chemical cleaning complying with SSPC-SP 1, "Solvent Cleaning," and pickling treatment complying with SSPC-SP 8, "Pickling," followed by hot-dip galvanizing complying with ASTM A123/A123M.
 - c. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
 - d. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
- 1) Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2. Metallic-Coated Steel Sheet Finish:

- a. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
 - b. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the coating to be applied over it.
 - c. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
- 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
3. Stainless-Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 4.

2.4 MISCELLANEOUS DETENTION TOILET ACCESSORIES

- A. Recessed, Detention Toilet Tissue Holder: Minimum **5-inch diameter by 4-1/2 inches (127-mm diameter by 114 mm)** deep; formed from **0.062-inch- (1.57-mm-)** thick, stainless-steel sheet. Secure to wall with rear-mounting steel strap and adjustment bolts.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**
 - e. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - f. **[Norix Group, Inc.]**
 - g. **[PSI LLC]**
 - h. **[Willoughby Industries, Inc.]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bradley Corporation]**
 - d. **[Brey-Krause Manufacturing Co.]**



- e. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]
- f. [Norix Group, Inc.]
- g. [PSI LLC]
- h. [Willoughby Industries, Inc.]
- i. <Insert manufacturer's name>

3. Face: [1-inch (25.4-mm) lip around entire face][7-inch- (178-mm-) square face flange].

B. Recessed, Detention Soap Dish: Minimum inside dimensions of **5-3/4 inches wide by 4-1/2 inches high by 2-1/2 inches (146 mm wide by 114 mm high by 64 mm)** deep with **3/4-inch (19-mm)** lip around entire face; formed from **[0.062-inch- (1.57-mm-)][0.050-inch- (1.27-mm-)]** thick, stainless-steel sheet. Secure to wall with rear-mounting steel strap and adjustment bolts.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Acorn Engineering Company; a Division of Morris Group International]
- b. [ASI-American Specialties, Inc.]
- c. [Bradley Corporation]
- d. [Norix Group, Inc.]
- e. [Willoughby Industries, Inc.]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Acorn Engineering Company; a Division of Morris Group International]
- b. [ASI-American Specialties, Inc.]
- c. [Bradley Corporation]
- d. [Norix Group, Inc.]
- e. [Willoughby Industries, Inc.]
- f. <Insert manufacturer's name>

C. Materials:

- 1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

D. Stainless-Steel Finish:

- 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- 2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.

2.5 DETENTION MIRRORS

- A. Small, Framed Detention Mirror: Formed from **0.038-inch- (0.95-mm-)** thick, stainless-steel sheet with fiberboard backing; enclosed in a frame formed from **0.064-inch (1.63-mm)** nominal-thickness, zinc-plated steel sheet; with round corners. Fabricate frame with welded and ground corners or from one piece of metal.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Maximum Security Products Corp]**
 - b. **[PSI LLC]**
 - c. **[Sweeper Metal Fabricators Corp]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Maximum Security Products Corp]**
 - b. **[PSI LLC]**
 - c. **[Sweeper Metal Fabricators Corp]**
 - d. **<Insert manufacturer's name>**
 3. Size: **[Approximately 9-1/2 by 11 inches (241 by 279 mm)]<Insert dimensions>**.
 4. Mounting: **[Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate][Chase mounting with welded anchor nuts on backplate]**.
- B. Small, Integrally Framed Detention Mirror: Mirror and integral frame formed from a single sheet of **[0.038-inch- (0.95-mm-)][0.062-inch- (1.57-mm-)]** thick, stainless steel; with round corners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Norix Group, Inc.]**
 - c. **[PSI LLC]**
 - d. **[Willo Products Company, Inc.]**
 - e. **[Willoughby Industries, Inc.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Norix Group, Inc.]**
 - c. **[PSI LLC]**
 - d. **[Willo Products Company, Inc.]**
 - e. **[Willoughby Industries, Inc.]**
 - f. **<Insert manufacturer's name>**



3. Size: **[Approximately 9-1/2 by 11 inches (241 by 279 mm)]<Insert dimensions>.**
 4. Mounting: **[Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate][Chase mounting with welded anchor nuts on backplate].**
- C. Large, Framed Detention Mirror with Square Corners: Formed from **[0.038-inch- (0.95-mm-)][0.078-inch- (1.98-mm-)]** thick, stainless-steel sheet with fiberboard backing; enclosed in a metal frame.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Brey-Krause Manufacturing Co.]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Willoughby Industries, Inc.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Brey-Krause Manufacturing Co.]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Willoughby Industries, Inc.]**
 - f. **<Insert manufacturer's name>**
 3. Size: **[Minimum 12 by 16 inches (305 by 406 mm)]<Insert dimensions>.**
 4. Frame: Formed from **[0.064-inch (1.63-mm) nominal-thickness, chrome-plated steel][0.062-inch- (1.57-mm-) thick, stainless-steel][0.078-inch- (1.98-mm-) thick, stainless-steel]** sheet. Fabricate frame with welded and ground corners or from one piece of metal.
 5. Mounting: **[Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate][Chase mounting with welded anchor nuts on backplate].**
- D. Large, Framed Detention Mirror with Round Corners: Formed from a single sheet of **[0.038-inch- (0.95-mm-)][0.078-inch- (1.98-mm-)]** thick, stainless steel; enclosed in a metal frame.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**
 - d. **[Sweeper Metal Fabricators Corp]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**
 - d. **[Sweeper Metal Fabricators Corp]**
 - e. **<Insert manufacturer's name>**
3. Size: **[Minimum 12 by 16 inches (305 by 406 mm)]<Insert dimensions>**.
 4. Frame: Formed from **[0.064-inch (1.63-mm) nominal-thickness, chrome-plated steel][0.078-inch- (1.98-mm-) thick, stainless-steel]** sheet. Fabricate frame with welded and ground corners or from one piece of metal.
 5. Mounting: **[Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate][Chase mounting with welded anchor nuts on backplate]**.
- E. Large, Integrally Framed Detention Mirror with Round Corners: Mirror and integral frame formed from **[0.038-inch- (0.95-mm-)][0.062-inch- (1.57-mm-)][0.078-inch- (1.98-mm-)]** thick, stainless-steel sheet; with round corners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Southern Folger Detention Equipment Company]**
 - h. **[Willo Products Company, Inc.]**
 - i. **[Willoughby Industries, Inc.]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[ASI-American Specialties, Inc.]**
 - c. **[Bobrick Washroom Equipment, Inc]**
 - d. **[Bradley Corporation]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Southern Folger Detention Equipment Company]**
 - h. **[Willo Products Company, Inc.]**
 - i. **[Willoughby Industries, Inc.]**
 - j. **<Insert manufacturer's name>**
 3. Size: **[Minimum 12 by 16 inches (305 by 406 mm)]<Insert dimensions>**.
 4. Mounting: **[Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate][Chase mounting with welded anchor nuts on backplate]**.

F. Materials:

1. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) coating designation.
2. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

G. Finishes:

1. Metallic-Coated Steel Sheet Finish:

- a. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- b. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the coating to be applied over it.
- c. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2. Stainless-Steel Finish:

- a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2) Mirrorlike Reflective, Nondirectional Polish: No. 8.

3. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

2.6 DETENTION GRAB BARS

A. Grab Bars: **1-1/2 inches (38.1 mm)** in diameter; formed from **0.038-inch- (0.95-mm-)** thick, stainless-steel tubing, with **3-inch- (76.2-mm-)** diameter flanges formed from **0.125-inch- (3.18-mm-)** thick, stainless steel. Closure plates formed from **0.125-inch- (3.18-mm-)** thick, stainless steel. All-welded construction.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**

- c. **[Brey-Krause Manufacturing Co.]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Willoughby Industries, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[ASI-American Specialties, Inc.]**
 - b. **[Bradley Corporation]**
 - c. **[Brey-Krause Manufacturing Co.]**
 - d. **[Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Willoughby Industries, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Length: **[As indicated on Drawings][36 inches (914 mm) long]<Insert length>**.
4. Mounting: **[Front mounting with security fasteners][Chase mounting with welded anchor nuts on backplate]**.

B. Materials:

- 1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- 2. Stainless-Steel Tubing: ASTM A1016/A1016M, austenitic stainless steel, Type 304, seamless.
- 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

C. Stainless-Steel Finish:

- 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- 2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.

2.7 DETENTION SHOWER SEATS

- A. Shower Seats: Double-pan retractable, recessed shower seat with recessed handle. Approximately **16-by 16-inch (406- by 406-mm)** overall size formed from **[0.062-inch- (1.57-mm-)][0.078-inch- (1.98-mm-)]** thick, stainless-steel sheet. Seat pivots on solid **0.375-inch- (9.5-mm-)** diameter stainless-steel rod and self-latches when closed. Minimum **750-lb (340-kg)** loading capacity.
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ASI-American Specialties, Inc.]**

- b. **[Norix Group, Inc.]**
- c. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[ASI-American Specialties, Inc.]**
- b. **[Norix Group, Inc.]**
- c. **<Insert manufacturer's name>**

B. Materials:

- 1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

C. Stainless-Steel Finish:

- 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- 2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.

2.8 FABRICATION

- A. Coordinate dimensions and attachment methods of detention toilet accessories with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Form edges and corners to be free of sharp edges and rough areas. Fold back exposed edges of unsupported sheet metal to form a **1/2-inch- (12.7-mm-)** wide hem on the concealed side, or ease edges to a radius of approximately **1/32 inch (0.8 mm)** and support with concealed stiffeners.
- D. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld corners and seams continuously to comply with referenced AWS standard and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention toilet accessories rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- G. Cut, reinforce, drill, and tap detention toilet accessories to receive hardware, security fasteners, and similar items.
- H. Form exposed work true to line and level with accurate angles and surfaces. Grind off and ease edges unless otherwise indicated.
- I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners. Locate joints where least conspicuous.

2.9 SECURITY FASTENERS

- A. Security Fasteners: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **<Insert manufacturer's name>**
 - 3. Drive-System Type: **[Pinned Torx-Plus][Pinned Torx]<Insert system>**.
 - 4. Fastener Strength: **120,000 psi (827 MPa)**.
 - 5. Socket Button Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 - 6. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 - 7. Socket Head Cap Fasteners:

- a. Heat-treated alloy steel, ASTM A574.
- b. Stainless steel, **ASTM F837 (ASTM F837M)**, Group 1 CW.

8. Protective Coatings for Heat-Treated Alloy Steel:

- a. Zinc and clear trivalent chromium where indicated.
- b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.10 SECURITY SEALANTS

A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Master Builders Solutions]**
- b. **[Pecora Corporation]**
- c. **<Insert manufacturer's name>**

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Master Builders Solutions]**
- b. **[Pecora Corporation]**
- c. **<Insert manufacturer's name>**

- 3. Sealant shall have a VOC content of 250 g/L or less.
- 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
- 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

B. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]
 - b. [Master Builders Solutions]
 - c. [Pecora Corporation]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]
 - b. [Master Builders Solutions]
 - c. [Pecora Corporation]
 - d. <Insert manufacturer's name>
3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.11 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to [four]<Insert safety factor> times the load imposed, as determined by testing according to ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below:
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hot-dip galvanized according to ASTM A153/A153M or ASTM F2329/F2329M.
- C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- D. Proprietary Built-in Masonry Anchors: Fabricated from **[0.134-inch (3.42-mm) nominal-thickness steel**



sheet][1/4-inch (6-mm) nominal-thickness steel plate][1/2-inch (12.7-mm) nominal-thickness steel plate] into [6-inch- (152-mm-)][8-inch- (203-mm-)] deep blocks matching size of concrete masonry units[; with weld nuts attached on inside to receive field-bolted attachments].

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[M/BED Block Systems, LLC.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[M/BED Block Systems, LLC.]**
 - b. **<Insert manufacturer's name>**
3. Finish: **[Factory primed for field painting for anchors with field-welded attachments][Polyester powder coat for anchors with bolted attachments][Epoxy paint for anchors with bolted attachments].**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention toilet accessories.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention toilet accessory connections before detention toilet accessory installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention toilet accessories.
- D. Inspect built-in and cast-in anchor installations before installing detention toilet accessories to verify that anchor installations comply with requirements. Prepare inspection reports.
 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Verify locations of detention toilet accessories.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for

securing detention toilet accessories to in-place construction. Include threaded fasteners for **[concrete][and][masonry]** inserts, security fasteners, and other connectors.

- B. Provide temporary bracing or anchors in formwork for items that are to be built into **[concrete][or][masonry]** or similar construction.
- C. Apply **[polyurethane][epoxy]** security sealant around perimeter in a continuous ribbon on back of detention toilet accessories before installation.
- D. Security Fasteners: Install detention toilet accessories using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials. **[Provide stainless-steel security fasteners in stainless-steel materials.]**
- E. Grab Bars: Install to withstand a downward load of not less than **250 lbf (1112 N)** per ASTM F446.

3.3 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace detention work where inspections indicate that work does not comply with specified requirements.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification **[endorsed by Detention Specialist]** that states installed products and their installation comply with requirements in the Contract Documents.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary labels and protective coatings.
- B. Adjust curved safety hooks to release with application of **[8-lbf (35.6-N)][15 lbf (66.7 N)][20 lbf (89.0 N)]<Insert amount>** load.
 - 1. Verify tightness of accessible connections by calibrated torque driver.
- C. Touchup Painting:
 - 1. Immediately after erection, clean bolted connections and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 2. Cleaning and touchup painting of bolted connections and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION 10 28 13 63



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Task	Specification	Specification Description
10 28 13 63	01 11 19 00	No Specification Required
10 28 13 63	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 16 00	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 16 13	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 16 13	10 28 13 63	Detention Toilet Accessories



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SECTION 10 28 19 00 - TUB AND SHOWER ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framed shower doors and enclosures.
2. Frameless shower doors and enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for shower doors and enclosures.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For tub and shower doors and enclosures.

1. Include plans, elevations, sections, and attachment details.

D. Samples for Initial Selection: For each type of exposed finish.

E. Samples for Verification: For tub and shower doors and enclosures.

1. Each type of mounting and operating hardware; full size.
2. Glass and glazing; **12 inches (305 mm)** square.
3. Trim; **12-inch (305-mm)** lengths.

F. Product Schedule: For tub and shower doors and enclosures. [**Use same designations indicated on Drawings.**]

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tub and shower doors and enclosures to include in maintenance manuals.



1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of tub and shower doors and enclosure as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Verify dimensions by field measurements before fabrication and indicate on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tub and shower doors and enclosures that fail in materials or workmanship within specified warranty period, without monetary limitation.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: **[Two][Three]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMED ENCLOSURES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Alumax Bath Enclosures]**
 - 2. **[American Shower Door Corporation]**
 - 3. **[Anzzi; a brand of SWCorp]**
 - 4. **[Artistcraft Shower Doors]**
 - 5. **[Basco, Inc]**
 - 6. **[Century Bathworks]**
 - 7. **[Fleurco Products Inc.]**
 - 8. **[Hartung Glass Industries]**
 - 9. **[HMI]**
 - 10. **[Seawin Hospitality; Seawin Global]**
 - 11. **[Southeastern Aluminum Products, LLC]**
 - 12. **[VIGO Industries LLC]**
 - 13. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Alumax Bath Enclosures]**
 2. **[American Shower Door Corporation]**
 3. **[Anzzi; a brand of SWCorp]**
 4. **[Artistcraft Shower Doors]**
 5. **[Basco, Inc]**
 6. **[Century Bathworks]**
 7. **[Fleurco Products Inc.]**
 8. **[Hartung Glass Industries]**
 9. **[HMI]**
 10. **[Seawin Hospitality; Seawin Global]**
 11. **[Southeastern Aluminum Products, LLC]**
 12. **[VIGO Industries LLC]**
 13. **<Insert manufacturer's name>**
- C. Glass panels with full perimeter frames of extruded aluminum with screw-fastened corners. Minimum **3/8-inch (10-mm)** penetration of glass into frame. Framing members of thickness required to support imposed loads.
- D. Frames, Hardware, and Trim: Manufacturer's standard units as indicated and as required for a complete installation.
1. Materials: Aluminum; **ASTM B221 (ASTM B221M)**.
 2. Finish: **[Clear anodic][Color anodic][Baked enamel or powder coat]<Insert finish>**.
 3. Color: **[Silver][Gold][Black]<Insert color>**.
- E. Bypassing Doors: Sliding units suspended from top track by fully adjustable ball-bearing rollers. Self-draining sill tracks with nylon panel guides. Molded jamb bumpers with concealed fasteners.
1. Door Pulls: Full-door-width, single-sided towel bars.
- F. Swinging Doors: **[Full-height piano hinge][Top-and-bottom pivot hinges]**. Manufacturer's standard pulls and latch.
- G. Glazing:
1. **[Clear][Clear obscured][Tinted][Patterned]<Insert glass>** fully tempered. Comply with requirements in Section 088000 "Glazing."
 2. Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.
 - a. Glass Nominal Thickness: **[6][10]** mm.
 - b. Clear Glass: ASTM C1048, Type I, Quality-Q3, Class I (clear), Kind FT.
 - 1) Obscured Panels: **[Acid etched][Sandblasted]<Insert appearance>**.
 - c. Tinted Glass: ASTM C1048, Type I, Quality-Q3, Class II, Kind FT.
 - 1) Color: **[Bronze][Green]<Insert color>**.
 - d. Patterned Glass: ASTM C1048, Kind FT (fully tempered), Type II, Class 1 (clear), Form 3; Quality-Q6, Finish F1 (patterned, one side).
 - 1) Pattern: **[Manufacturer's standard][Pattern P3 (random)]<Insert pattern>**.

- e. Protective, Self-Cleaning, Glass Coating: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

H. Fasteners: Manufacturer's standard stainless steel or other noncorrosive fasteners.

I. Sealant: Mildew-resistant, single-component, nonsag, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, for Use NT.

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.2 FRAMELESS ENCLOSURES

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Alumax Bath Enclosures]**
2. **[American Shower Door Corporation]**
3. **[Anzzi; a brand of SWCorp]**
4. **[Artistcraft Shower Doors]**
5. **[Basco, Inc]**
6. **[Century Bathworks]**
7. **[Fleurco Products Inc.]**
8. **[Hartung Glass Industries]**
9. **[HMI]**
10. **[PRL Glass Systems Inc.]**
11. **[Seawin Hospitality; Seawin Global]**
12. **[SouFlo]**
13. **[Southeastern Aluminum Products, LLC]**
14. **[VIGO Industries LLC]**
15. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Alumax Bath Enclosures]**
 2. **[American Shower Door Corporation]**
 3. **[Anzzi; a brand of SWCorp]**
 4. **[Artistcraft Shower Doors]**
 5. **[Basco, Inc]**
 6. **[Century Bathworks]**
 7. **[Fleurco Products Inc.]**
 8. **[Hartung Glass Industries]**
 9. **[HMI]**
 10. **[PRL Glass Systems Inc.]**
 11. **[Seawin Hospitality; Seawin Global]**
 12. **[SouFlo]**
 13. **[Southeastern Aluminum Products, LLC]**
 14. **[VIGO Industries LLC]**
 15. **<Insert manufacturer's name>**
- C. Frameless glass panels with mounting and operating hardware of types and sizes required to support imposed loads.
- D. Hardware and Trim: Manufacturer's standard units as indicated and as required for complete installation.
1. Materials:
 - a. Aluminum:
 - 1) Finish: **[Clear anodic][Color anodic][Baked enamel or powder coat]<Insert finish>**.
 - 2) Color: **[Silver][Gold][Black]<Insert color>**.
 - b. Brass:
 - 1) Finish: **[Chrome][Satin chrome][Brass][Satin brass][Oil-rubbed brass][Bronze][Brushed bronze][Oil-rubbed bronze]<Insert finish>**.
 - c. Stainless Steel Sheet and Plate:
 - 1) Finish: **[ASTM A480/A480M No. 4 directional satin finish][ASTM A480/A480M No. 6 dull satin finish][ASTM A480/A480M No. 7 reflective, directional finish]<Insert finish>**.
 - d. Stainless Steel Tubing:
 - 1) Finish: **[180-Grit Polished Finish: Uniform, directionally textured finish][280-Grit Polished Finish: Fine finish][Polished and Buffed Finish: 320-grit finish followed by buffing]<Insert finish>**.
 - a) Polished and Buffed Finish: Buff to **[a high luster finish][a mirrorlike finish][match Architect's sample]**.
- E. Bypass Doors: Sliding units suspended from extruded-aluminum header track by fully adjustable, sealed, heavy-duty ball-bearing rollers. Self-draining sill tracks with nylon panel guides. Molded jamb bumpers with concealed fasteners.
1. Door Pulls: **[Full-door-width, single-sided towel bars][Single-sided vertical blade handles][Single-sided knobs]<Insert type>**.



2. Safety Clip System: Manufacturer's standard safety device designed to prevent doors from falling off sliding track.
- F. Sliding Door and Fixed In-Line Panel: Sliding unit with exposed, adjustable, heavy-duty rollers operating above full-span header bar. Door bottom guide, antilift fittings, stoppers, and mounts for fixed panel and header bar.
 1. Door Pulls: Back-to-back, **[D-pull][mitered pull][ladder pull][C-pull][knob]<Insert type>**.
 2. Sill Strip: Manufacturer's standard sill strip designed to direct dripping water back into the enclosure.
- G. Swinging Doors: Hinged for **[90 degrees outwards swing, self-closing][90 degrees inwards and outwards swing, self-centering when doors are within 15 degrees of closed position][full rotation swing, self-centering when doors are within 15 degrees of closed position]**. Soft bulb seal or wipes; affixed to door to direct water back into enclosure and provide a tight water seal.
 1. Hinges: **[Full-height piano][Side-hinged, 90-degree patch][Side-hinged, 135-degree patch][Side-hinged, 180-degree patch][Top-and-bottom pivots]**.
 2. Door Pulls: **[Single-sided][Back-to-back], [towel bar][D-pull][mitered pull][ladder pull][C-pull][knob]<Insert type>**.
 - a. Towel Bar Length: **[18 inches (460 mm)][24 inches (610 mm)][30 inches (760 mm)]<Insert dimension>**.
- H. Fixed Panels: **[Side][Top-and-bottom]** mounts; match hinges in material and finish.
- I. Ventilating Transom: Rotating clamps centered on transom.
- J. Glazing:
 1. **[Clear][Clear obscured][Tinted][Patterned]<Insert glass>** fully tempered. Comply with requirements in Section 088000 "Glazing."
 2. Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.
 - a. Glass Nominal Thickness: **[As determined by manufacturer based on panel size][8 mm][10 mm][12 mm]<Insert thickness>**.
 - b. Clear Glass: ASTM C1048, Type I, Quality-Q3, Class I (clear), Kind FT.
 - 1) Obscured Panels: **[Acid etched][Sandblasted]<Insert appearance>**.
 - c. Tinted Glass: ASTM C1048, Type I, Quality-Q3, Class II, Kind FT.
 - 1) Color: **[Bronze][Green]<Insert color>**.
 - d. Patterned Glass: ASTM C1048, Kind FT (fully tempered), Type II, Class 1 (clear), Form 3; Quality-Q6, Finish F1 (patterned, one side).
 - 1) Pattern: **[Manufacturer's standard][Pattern P3 (random)]<Insert pattern>**.
 - e. Protective, Self-Cleaning, Glass Coating: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

- K. Fasteners: Manufacturer's standard stainless steel or other noncorrosive fasteners.
- L. Sealant: Mildew-resistant, single-component, nonsag, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Sealant shall have a VOC content of 250 g/L or less.
 - 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- M. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: **ASTM B209 (ASTM B209M).**
 - b. Extrusions: **ASTM B221 (ASTM B221M).**
 - 2. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 302 or 304.
 - 3. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 302 or 304.
 - 4. Copper-Alloy Sheet and Shapes: ASTM B36/B36M.
 - 5. Copper-Alloy Extrusions: ASTM B455, alloy UNS No. C38500 (architectural brass).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare and install per manufacturer's written instructions unless more stringent requirements are contained in NGA's "GANA Glazing Manual."
- B. Clean substrates, removing projections, filling voids, and sealing joints.
- C. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.
- D. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.
- E. Install components to drain and return water to tub or shower.



10 - Specialties

- F. Install doors to produce smooth operation and tight fit at contact points.
- G. Repair, refinish, or replace components damaged during installation.

3.2 ADJUSTING AND CLEANING

- A. Adjust operating parts and hardware for smooth, quiet operation and watertight closure. Lubricate hardware and moving parts.
- B. Remove nonpermanent labels, and clean surfaces immediately after installation.

3.3 TUB AND SHOWER DOOR AND ENCLOSURE HARDWARE SCHEDULE

- A. **<Insert schedule>.**

END OF SECTION 10 28 19 00



Task	Specification	Specification Description
10 28 19 00	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 19 16	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 19 16	10 28 19 00	Tub and Shower Enclosures
10 28 19 19	10 28 00 00	Toilet, Bath, and Laundry Accessories
10 28 19 19	10 28 19 00	Tub and Shower Enclosures



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SECTION 10 44 13 00 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:
2. Fire-protection cabinets for the following:
 - a. Portable fire extinguisher.
 - b. Portable fire extinguisher and fire-hose valve.
 - c. Portable fire extinguisher, fire hose, rack, and fire-hose valve.
 - d. Fire-hose valve.
 - e. Fire hose, rack, and fire-hose valve.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.
2. Section 211000 "Water-Based Fire-Suppression Systems" for fire-hose connections.

1.2 ALLOWANCES

- A. Fire-protection cabinets are part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by **<Insert name of unit price>**.

1.4 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.



- B. Shop Drawings: For fire-protection cabinets.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Samples for Initial Selection: For each type of exposed finish required.
- E. Samples for Verification: For each type of exposed finish required, prepared on samples **6 by 6 inches (150 by 150 mm)** square.
- F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. **[Use same designations indicated on Drawings.]**

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.7 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of **[fire extinguishers][fire hoses, hose valves, and hose racks]** indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FIRE-PROTECTION CABINET

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Babcock-Davis]**

2. [Croker; a Division of Morris Group International]
 3. [Guardian Fire Equipment, Inc]
 4. [JL Industries; Activar Construction Products Group, Inc.]
 5. [Larsen's Manufacturing Company]
 6. [Modern Metal Products]
 7. [MOON American, Inc.]
 8. [Nystrom, Inc.]
 9. [Potter Roemer LLC; a Division of Morris Group International]
 10. [Strike First Corporation of America]
 11. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Babcock-Davis]
 2. [Croker; a Division of Morris Group International]
 3. [Guardian Fire Equipment, Inc]
 4. [JL Industries; Activar Construction Products Group, Inc.]
 5. [Larsen's Manufacturing Company]
 6. [Modern Metal Products]
 7. [MOON American, Inc.]
 8. [Nystrom, Inc.]
 9. [Potter Roemer LLC; a Division of Morris Group International]
 10. [Strike First Corporation of America]
 11. <Insert manufacturer's name>
- C. Fire-Protection Cabinet Type: Suitable for fire [extinguisher][extinguisher and hose valve][hose, rack, valve, and extinguisher][hose, rack, and valve][-hose valve].
- D. Cabinet Construction: [Nonrated][One-hour fire rated][Two-hour fire rated].
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from **0.043-inch- (1.09-mm-)** thick cold-rolled steel sheet lined with minimum **5/8-inch- (16-mm-)** thick fire-barrier material. Provide factory-drilled mounting holes.
- E. Cabinet Material: [Cold-rolled steel sheet][Aluminum sheet][Stainless steel sheet].
1. Shelf: Same metal and finish as cabinet.
- F. Recessed Cabinet:
1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as [plaster stop][drywall bead].
 2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
 3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- G. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
1. Square-Edge Trim: **1-1/4- to 1-1/2-inch (32- to 38-mm)** backbend depth.
 2. Rolled-Edge Trim: [**2-1/2-inch (64-mm)**][**4-inch (102-mm)**][**4-1/2-inch (114-mm)**]<Insert dimension> backbend depth.



- H. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- I. Cabinet Trim Material: **[Steel sheet][Aluminum sheet][Extruded-aluminum shapes][Stainless steel sheet][Copper-alloy brass sheet][Copper-alloy bronze sheet][Same material and finish as door]**.
- J. Door Material: **[Steel sheet][Aluminum sheet][Extruded-aluminum shapes][Stainless steel sheet][Copper-alloy brass sheet][Copper-alloy bronze sheet]**.
- K. Door Style: **[Fully glazed, frameless, backless, acrylic panel][Fully glazed panel with frame][Full acrylic bubble, frameless][Full acrylic bubble with frame][Full acrylic bubble with frameless, rotating turntable][Horizontal duo panel with frame][Vertical duo panel with frame][Center glass panel with frame][Solid opaque panel with frame][Flush opaque panel, frameless, with no exposed hinges]**.
- L. Door Glazing: **[Clear float glass][Tempered float glass (clear)][Tempered float glass (bronze tint)][Break glass][Tempered break glass][Wire glass][Acrylic sheet][Break acrylic bubble][Molded acrylic bubble]**.
 - 1. Acrylic Sheet Color:
 - a. **[Clear][Bronze]** transparent acrylic sheet.
 - b. Clear transparent acrylic sheet painted **[white][red][black]** on unexposed side.
 - 2. Acrylic Bubble Color: **[Clear][Bronze][Red]**, transparent.
- M. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide **[projecting lever handle with cam-action latch][projecting door pull and friction latch][recessed door pull and friction latch][manufacturer's standard]**.
 - 2. Provide **[continuous hinge, of same material and finish as trim,][concealed hinge][pivot hinge][manufacturer's standard hinge]**, permitting door to open 180 degrees.
- N. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
 - 3. Break-Glass Door Handle: Manufacturer's standard, integral to glass with the words "PULL TO BREAK GLASS" applied to handle.
 - 4. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 5. Door Lock: **[Cam lock that allows door to be opened during emergency by pulling sharply on door handle][Cylinder lock, keyed alike to other cabinets]**.
 - 6. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate **[as indicated][as directed by Architect]<Insert location>**.
 - a. Identify fire extinguisher in fire-protection cabinet with the words **"[FIRE EXTINGUISHER]<Insert identification>."**
 - 1) Location: Applied to **[cabinet door][cabinet glazing][location indicated on Drawings]**.
 - 2) Application Process: **[Silk-screened][Engraved][Etched][Decals][Pressure-**

- 3) Lettering Color: [Red][Black][White].
 - 4) Orientation: [Vertical][Horizontal][As indicated on Drawings].
7. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by [batteries][low voltage, complete with transformer].
- O. Materials:
1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
 - a. Finish: [Factory primed for field painting][Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603].
 - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Color: [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 2. Aluminum: **ASTM B221 (ASTM B221M)** for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet.
 - a. Finish: [Clear anodic][Color anodic][Baked enamel or powder coat].
 - b. Color: [Light bronze][Medium bronze][Dark bronze][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
 3. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.
 - a. Finish: [ASTM A480/A480M No. 4 directional satin finish,][ASTM A480/A480M No. 8 mirrorlike reflective, nondirectional polish]<Insert finish>.
 4. Copper Alloy, Brass: ASTM B36/B36M alloy [as standard with manufacturer]<Insert requirements>.
 - a. Finish: [Polished][Satin][As selected by Architect from full range of industry finishes]<Insert finish>.
 5. Copper Alloy, Bronze: ASTM B36/B36M alloy [as standard with manufacturer]<Insert requirements>.
 - a. Finish: [Mirror polish][Satin polish][Satin oxidized oil rub][Clear baked enamel][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 6. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3, [3][6] mm thick.
 7. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, [Class 1 (clear)][Class 2 (tinted, heat absorbing, and light reducing), bronze tint].
 8. Break Glass: Clear annealed float glass, ASTM C1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.
 9. Tempered Break Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.
 10. Wire Glass: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.
 11. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), [1.5][3][6] mm thick, with [Finish 1 (smooth or polished)][Finish 2 (patterned, textured)].

2.4 SECURITY FIRE-PROTECTION CABINET

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Babcock-Davis]**
 2. **[Croker; a Division of Morris Group International]**
 3. **[Guardian Fire Equipment, Inc]**
 4. **[JL Industries; Activar Construction Products Group, Inc.]**
 5. **[Larsen's Manufacturing Company]**
 6. **[Nystrom, Inc.]**
 7. **[Potter Roemer LLC; a Division of Morris Group International]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Babcock-Davis]**
 2. **[Croker; a Division of Morris Group International]**
 3. **[Guardian Fire Equipment, Inc]**
 4. **[JL Industries; Activar Construction Products Group, Inc.]**
 5. **[Larsen's Manufacturing Company]**
 6. **[Nystrom, Inc.]**
 7. **[Potter Roemer LLC; a Division of Morris Group International]**
 8. **<Insert manufacturer's name>**
- C. Security Fire-Protection Cabinet Type: Suitable for fire **[extinguisher][extinguisher and hose valve][hose, rack, valve, and extinguisher][hose, rack, and valve][hose valve]**.
- D. Cabinet Construction: **[Nonrated][One-hour fire rated][Two-hour fire rated]**.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls lined with minimum **5/8-inch- (16-mm-)** thick fire-barrier material.
- E. Cabinet Material: **[0.068-inch- (1.72-mm-) thick steel sheet][0.097-inch- (2.45-mm-) thick steel sheet][0.078-inch- (1.98-mm-) thick stainless steel sheet]**.
1. Shelf: Same metal and finish as cabinet.
- F. Recessed Cabinet:
1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- G. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
1. Square-Edge Trim: **1-1/4- to 1-1/2-inch (32- to 38-mm)** backbend depth.
 2. Rolled-Edge Trim: **2-1/2-inch (64-mm)** backbend depth.
- H. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- I. Cabinet Trim Material: **[Steel sheet][Stainless steel sheet][Same material and finish as door]**.

- J. Door Material: **[0.097-inch- (2.45-mm-) thick steel][0.078-inch- (1.98-mm-) thick stainless steel][0.109-inch- (2.78-mm-) thick stainless steel]** sheet.
- K. Door Style: Solid opaque panel with frame.
- L. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated, and as follows:
1. Recessed door pull.
 2. Continuous Hinge: Same material and finish as trim, permitting door to open 180 degrees.
 3. Mechanical Deadlock:
 - a. Lockbolt retracted and extended by five-tumbler **[paracentric][mogul]** cylinder; keyed one side.
 - 1) Lockbolt: **1-1/2 inches high by 3/4 inch (38 mm high by 19 mm) thick; 5/8-inch (16-mm) throw.**
 - b. As specified in Section 119814 "Detention Door Hardware."
 4. Mechanical Snaplatch:
 - a. Automatic snaplatch when closed; latchbolt retracted by five-tumbler **[paracentric][mogul]** cylinder; keyed one side.
 - 1) Lockbolt: **1 inch high by 7/16 inch (25 mm high by 11 mm) thick; 5/16-inch (8-mm) throw.**
 - b. As specified in Section 119814 "Detention Door Hardware."
- M. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate **[as indicated][as directed by Architect]<Insert location>**.
 - a. Identify fire extinguisher in security fire-protection cabinet with the words **"[FIRE EXTINGUISHER]<Insert identification>."**
 - 1) Location: Applied to **[cabinet door][location indicated on Drawings]**.
 - 2) Application Process: **[Silk-screened][Engraved][Etched][Decals][Pressure-sensitive vinyl letters]**.
 - 3) Lettering Color: **[Red][Black][White]**.
 - 4) Orientation: **[Vertical][Horizontal][As indicated on Drawings]**.
 3. Keys: Three per door lock.
- N. Materials:
1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
 - a. Finish: **[Factory primed for field painting][Baked enamel or powder coat]**.
 - b. Color: **[Match Architect's sample][As selected by Architect from full range of industry**

colors]<Insert color>.

2. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.
 - a. Finish: **[ASTM A480/A480M No. 4 directional satin finish][ASTM A480/A480M No. 8 mirrorlike reflective, nondirectional polish]<Insert finish>**.

2.5 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Miter corners and grind smooth.
 3. Provide factory-drilled mounting holes.
 4. Prepare doors and frames to receive locks.
 5. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum **1/2 inch (13 mm)** thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames and grind smooth.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose **[valves][racks]** and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where

[recessed][and][semirecessed] cabinets will be installed.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for [recessed][and][semirecessed] fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION OF FIRE-PROTECTION CABINETS

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated[or, if not indicated, at height indicated below:][or, if not indicated, at heights acceptable to authorities having jurisdiction.]
1. Fire-Protection Cabinet Mounting Height: **[42 inches (1067 mm)]<Insert dimension>** above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 2. Provide inside latch and lock for break-glass panels.
 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
 4. Fire-Rated Cabinets:
 - a. Install cabinet with not more than **1/16-inch (1.6-mm)** tolerance between pipe OD and knockout OD. Center pipe within knockout.
 - b. Seal through penetrations with firestopping sealant as specified in Section 078413 "Penetration Firestopping."
- C. Identification:
1. Apply [decals][vinyl lettering] at locations indicated.
 2. Apply [decals][vinyl lettering] on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair



10 - Specialties

by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13 00

SECTION 10 44 16 00 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, **[hand-carried][wheeled]** fire extinguishers[**and mounting brackets for fire extinguishers**].
- B. Owner-Furnished Material: **[Hand-carried][Wheeled]** fire extinguishers.
- C. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."
 - 2. Section 233813 "Commercial-Kitchen Hoods" for fire-extinguishing systems provided as part of commercial-kitchen exhaust hoods.

1.2 ALLOWANCES

- A. Fire Extinguishers are part of **<Insert name of allowance>**.

1.3 UNIT PRICES

- A. Work of this Section is affected by **<Insert name of unit price>**.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher[**and mounting brackets**].
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.[**Use same designations indicated on Drawings.**]

1.6 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.



1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.8 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: **[Six]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each **[fire-protection cabinet][and][mounting bracket]** indicated.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Amerex Corporation]**
 - b. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Babcock-Davis]**
 - d. **[Badger Fire Protection; a Carrier company]**
 - e. **[Buckeye Fire Equipment Company]**

- f. [Croker; a Division of Morris Group International]
 - g. [Guardian Fire Equipment, Inc]
 - h. [JL Industries; Activar Construction Products Group, Inc.]
 - i. [Kidde; Carrier Global Corporation]
 - j. [Larsen's Manufacturing Company]
 - k. [MOON American, Inc.]
 - l. [Nystrom, Inc.]
 - m. [Potter Roemer LLC; a Division of Morris Group International]
 - n. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
 - o. [Strike First Corporation of America]
 - p. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amerex Corporation]
 - b. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Babcock-Davis]
 - d. [Badger Fire Protection; a Carrier company]
 - e. [Buckeye Fire Equipment Company]
 - f. [Croker; a Division of Morris Group International]
 - g. [Guardian Fire Equipment, Inc]
 - h. [JL Industries; Activar Construction Products Group, Inc.]
 - i. [Kidde; Carrier Global Corporation]
 - j. [Larsen's Manufacturing Company]
 - k. [MOON American, Inc.]
 - l. [Nystrom, Inc.]
 - m. [Potter Roemer LLC; a Division of Morris Group International]
 - n. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
 - o. [Strike First Corporation of America]
 - p. <Insert manufacturer's name>
 3. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
 4. Valves: [Manufacturer's standard][Nickel-plated, polished-brass body].
 5. Handles and Levers: [Manufacturer's standard][Stainless steel].
 6. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B[, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging].
- B. Stored-Pressure Water Type : UL-rated 2-A, **2.5-gal. (9.5-L)** nominal capacity, with water in stainless steel container; with pressure-indicating gage.
 - C. Stored-Pressure Antifreeze Water Type : UL-rated 2-A, **2.5-gal. (9.5-L)** nominal capacity, with water and approved antifreeze solution mixed for temperatures as low as **minus 40 deg F (minus 40 deg C)** in stainless steel container; with pressure-indicating gage.
 - D. Stored-Pressure Water-Mist Type : UL-rated 2-A:C, **2.5-gal. (9.5-L)** nominal capacity, with water in enameled-steel container; with pressure-indicating gage.
 - E. Pressurized, AFFF-Foam Type : UL-rated [**2-A:10-B, 1.6-gal. (6-L)**][**3-A:20-B, 2.5-gal. (9.5-L)**] nominal capacity, with AFFF foam in stainless steel container; with pressure-indicating gage.



- F. Pressurized, FFFP-Foam Type : UL-rated 3-A:20-B, **2.5-gal. (9.5-L)** nominal capacity, with FFFP foam in stainless steel container; with pressure-indicating gage.
- G. Wet-Chemical Type : UL-rated 2-A:1-B:C:K, [**1.6-gal. (6-L)**][**2.5-gal. (9.5-L)**] nominal capacity, with potassium [**acetate**][**citrate**][**carbonate**]-based chemical in stainless steel container; with pressure-indicating gage.
- H. Regular Dry-Chemical Type : UL-rated **<Insert capacity>** nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.
- I. Regular Dry-Chemical Type in Steel Container : UL-rated [**2-B:C, 1-lb (0.4-kg)**][**10-B:C, 2.5-lb (1.1-kg)**][**10-B:C, 5-lb (2.3-kg)**][**40-B:C, 5.5-lb (2.5-kg)**][**40-B:C, 6-lb (2.7-kg)**][**60-B:C, 10-lb (4.5-kg)**][**120-B:C, 20-lb (9.1-kg)**] nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.
- J. Regular Dry-Chemical Type in Aluminum Container : UL-rated [**2-B:C, 1-lb (0.4-kg)**][**10-B:C, 2.5-lb (1.1-kg)**][**10-B:C, 5-lb (2.3-kg)**][**40-B:C, 5.5-lb (2.5-kg)**][**60-B:C, 10-lb (4.5-kg)**][**120-B:C, 20-lb (9.1-kg)**] nominal capacity, with sodium bicarbonate-based dry chemical in enameled-aluminum container.
- K. Regular Dry-Chemical Type in Brass Container : UL-rated [**40-B:C, 6-lb (2.7-kg)**][**60-B:C, 10-lb (4.5-kg)**][**120-B:C, 20-lb (9.1-kg)**] nominal capacity, with sodium bicarbonate-based dry chemical in chrome-plated-brass container.
- L. Multipurpose Dry-Chemical Type : UL-rated **<Insert capacity>** nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.
- M. Multipurpose Dry-Chemical Type in Steel Container : UL-rated [**1-A:10-B:C, 2.5-lb (1.1-kg)**][**2-A:10-B:C, 5-lb (2.3-kg)**][**3-A:40-B:C, 5-lb (2.3-kg)**][**3-A:40-B:C, 6-lb (2.7-kg)**][**4-A:60-B:C, 10-lb (4.5-kg)**][**10-A:120-B:C, 20-lb (9.1-kg)**] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- N. Multipurpose Dry-Chemical Type in Aluminum Container : UL-rated [**1-A:10-B:C, 2.5-lb (1.1-kg)**][**2-A:10-B:C, 5-lb (2.3-kg)**][**3-A:40-B:C, 5-lb (2.3-kg)**][**3-A:40-B:C, 6-lb (2.7-kg)**][**4-A:60-B:C, 10-lb (4.5-kg)**][**10-A:120-B:C, 20-lb (9.1-kg)**] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.
- O. Multipurpose Dry-Chemical Type in Brass Container : UL-rated [**2-A:10-B:C, 5-lb (2.3-kg)**][**3-A:40-B:C, 6-lb (2.7-kg)**][**4-A:60-B:C, 10-lb (4.5-kg)**][**4-A:80-B:C, 10-lb (4.5-kg)**][**10-A:120-B:C, 20-lb (9.1-kg)**] nominal capacity, with monoammonium phosphate-based dry chemical in chrome-plated-brass container.
- P. Purple-K Dry-Chemical Type in Aluminum Container : UL-rated [**10-B:C, 2.5-lb (1.1-kg)**][**30-B:C, 5-lb (2.3-kg)**][**120-B:C, 20-lb (9.1-kg)**] nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.
- Q. Purple-K Dry-Chemical Type in Brass Container : UL-rated [**80-B:C, 10-lb (4.5-kg)**][**120-B:C, 20-lb (9.1-kg)**] nominal capacity, with potassium bicarbonate-based dry chemical in chrome-plated-brass container.
- R. Carbon Dioxide Type : UL-rated [**5-B:C, 5-lb (2.3-kg)**][**10-B:C, 10-lb (4.5-kg)**][**10-B:C, 15-lb (6.8-kg)**][**10-B:C, 20-lb (9.1-kg)**] nominal capacity, with carbon dioxide in [**manufacturer's standard enameled-metal**][**enameled-steel**][**enameled-aluminum**] container.
- S. Dry-Powder Type : [**FM approved,**]UL-rated Class D, **30-lb (13.6-kg)** nominal capacity, with [**sodium chloride**][**copper**]-based powder in enameled-steel container; with pressure-indicating gage.

- T. Halon Type : **[5-B:C, 2.5-lb (1.1-kg)][10-B:C, 5-lb (2.3-kg)]** nominal capacity, in enameled-steel container; with pressure-indicating gage.
 - 1. UL-rated.
- U. Clean-Agent Type in Aluminum Container : UL-rated **[1-B:C, 1.4-lb (0.6-kg)][2-B:C, 2.5-lb (1.1-kg)][5-B:C, 5-lb (2.3-kg)]** nominal capacity, with HCFC Blend B agent and inert material in enameled-aluminum container; with pressure-indicating gage.
- V. Clean-Agent Type in Brass Container : UL-rated **[1-A:10-B:C, 11-lb (5-kg)][2-A:10-B:C, 15.5-lb (7-kg)]** nominal capacity, with HCFC Blend B agent and inert material in chrome-plated-brass container; with pressure-indicating gage.
- W. Clean-Agent Type in Steel Container : UL-rated **[5-B:C, 4.75-lb (2.2-kg)][1-A:10-B:C, 10-lb (4.5-kg)][2-A:10-B:C, 14-lb (6.4-kg)]** nominal capacity, with HFC blend agent and inert material in enameled-steel container; with pressure-indicating gage.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard **[galvanized]** steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or **[red][black]** baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amerex Corporation]**
 - b. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Babcock-Davis]**
 - d. **[Badger Fire Protection; a Carrier company]**
 - e. **[Buckeye Fire Equipment Company]**
 - f. **[Croker; a Division of Morris Group International]**
 - g. **[Guardian Fire Equipment, Inc.]**
 - h. **[JL Industries; Activar Construction Products Group, Inc.]**
 - i. **[Kidde; Carrier Global Corporation]**
 - j. **[Larsen's Manufacturing Company]**
 - k. **[Nystrom, Inc.]**
 - l. **[Potter Roemer LLC; a Division of Morris Group International]**
 - m. **[Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]**
 - n. **[Strike First Corporation of America]**
 - o. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amerex Corporation]**
 - b. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Babcock-Davis]**
 - d. **[Badger Fire Protection; a Carrier company]**



- e. [Buckeye Fire Equipment Company]
- f. [Croker; a Division of Morris Group International]
- g. [Guardian Fire Equipment, Inc]
- h. [JL Industries; Activar Construction Products Group, Inc.]
- i. [Kidde; Carrier Global Corporation]
- j. [Larsen's Manufacturing Company]
- k. [Nystrom, Inc.]
- l. [Potter Roemer LLC; a Division of Morris Group International]
- m. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
- n. [Strike First Corporation of America]
- o. <Insert manufacturer's name>

- 3. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

- 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

- a. Orientation: [Vertical][Horizontal].

2.4 WHEELED FIRE EXTINGUISHERS

- A. Wheeled Fire Extinguishers: Type, size, and capacity for locations indicated, complete with carriage.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Amerex Corporation]
- b. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
- c. [Badger Fire Protection; a Carrier company]
- d. [Buckeye Fire Equipment Company]
- e. [Croker; a Division of Morris Group International]
- f. [Guardian Fire Equipment, Inc]
- g. [JL Industries; Activar Construction Products Group, Inc.]
- h. [Potter Roemer LLC; a Division of Morris Group International]
- i. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
- j. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Amerex Corporation]
- b. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
- c. [Badger Fire Protection; a Carrier company]

- d. [Buckeye Fire Equipment Company]
 - e. [Croker; a Division of Morris Group International]
 - f. [Guardian Fire Equipment, Inc]
 - g. [JL Industries; Activar Construction Products Group, Inc.]
 - h. [Potter Roemer LLC; a Division of Morris Group International]
 - i. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
 - j. <Insert manufacturer's name>
- B. Source Limitations: Obtain wheeled fire extinguishers and fire extinguishers from single source from single manufacturer.
- 1. Carriage: Fabricated from enameled-steel pipe, complete with hanger assembly, long-range nozzle, hose, and [semipneumatic solid-rubber tires][wide-rim wheels].
 - a. Hose: [15 feet (4.6 m)][50 feet (15.2 m)][100 feet (30.5 m)].
- C. Pressurized, FFFP-Foam Type: UL-rated 20-A:160-B, 33-gal. (125-L) nominal capacity, with FFFP foam in stainless steel container.
- D. Regular Dry-Chemical Type: UL-rated [160-B:C, 50-lb (23-kg)][240-B:C, 150-lb (68-kg)][160-B:C, 250-lb (113-kg)] nominal capacity, with sodium bicarbonate-based dry chemical in [regulated][stored][direct]-pressure, enameled-steel container.
- E. Multipurpose Dry-Chemical Type: UL-rated [20-A:160-B:C, 30-lb (13.6-kg)][30-A:160-B:C, 50-lb (23-kg)][40-A:240-B:C, 125-lb (57-kg)][40-A:160-B:C, 250-lb (113-kg)] nominal capacity, with monoammonium phosphate-based dry chemical in [regulated][stored][direct]-pressure, enameled-[steel][aluminum][steel or -aluminum] container.
- F. Purple-K Dry-Chemical Type: UL-rated [160-B:C, 50-lb (23-kg)][320-B:C, 125-lb (57-kg)][160-B:C, 250-lb (113-kg)] nominal capacity, with potassium bicarbonate-based dry chemical in [regulated][stored][direct]-pressure, enameled-steel container.
- G. Carbon Dioxide Type: UL-rated [20-B:C, 50-lb (23-kg)][20-B:C, 100-lb (45-kg)] nominal capacity, with carbon dioxide in [manufacturer's standard enameled-metal][enameled-steel][enameled-aluminum] container.
- H. Dry-Powder Type: [FM approved,]UL-rated Class D, [sodium chloride-based powder, 150-lb (68-kg)][copper-based powder, 250-lb (113-kg)] nominal capacity, in regulated-pressure, enameled-steel container; with pressure-indicating gage.
- I. Clean-Agent Type: UL-rated [4-A:40-B:C, 65-lb (29-kg)][10-A:80-B:C, 150-lb (68-kg)] nominal capacity, with HCFC Blend B agent and inert material in stored-pressure, enameled-steel container; with pressure-indicating gage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.



- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers[**and mounting brackets**] in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Height: Top of fire extinguisher to be at [**42 inches (1067 mm)**]<Insert dimension> above finished floor.

END OF SECTION 10 44 16 00



Task	Specification	Specification Description
10 44 16 13	01 11 19 00	No Specification Required
10 44 16 13	10 44 13 00	Fire Protection Cabinets
10 44 16 13	10 44 16 00	Fire Extinguishers



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SECTION 10 45 00 00 - PHOTOLUMINESCENT EGRESS PATH MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes photoluminescent egress path markings.
- B. Related Requirements:
 - 1. Section 101423 "Panel Signage" for photoluminescent floor number and evacuation route signs.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For photoluminescent egress path markings.
 - 1. Include plans, elevations, and details.
- D. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** long or full size.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for luminance level of photoluminescent egress path markings.
- B. Sample Warranties: For special warranties.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace photoluminescent egress path markings that fail in materials or workmanship within specified warranty period.
 - 1. Failure includes, but is not limited to, decline in luminance below specified brightness level.
 - 2. Warranty Period: **[25]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Luminance: Comply with one of the following; testing by a qualified testing agency:
1. UL 1994.
 2. ASTM E2072; except that the charging source is to be **1 foot-candle (11 lux)** of fluorescent illumination for 60 min., and the minimum luminance is to be 30 millicandelas/sq. m after 10 min. and 5 millicandelas/sq. m after 90 min.

2.2 PHOTOLUMINESCENT EGRESS PATH MARKINGS

- A. Photoluminescent Egress Path Markings: Photoluminescent products containing no radioactive materials and requiring no electrical power.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[2/90 Sign Systems]**
 - b. **[Active Safety Corporation]**
 - c. **[American PERMALIGHT, Inc.]**
 - d. **[Balco; a CSW Industrials Company]**
 - e. **[Bright Path Lighting, inc.]**
 - f. **[Ecoglo, Inc.]**
 - g. **[Everglow NA, Inc.]**
 - h. **[GBC Safety Glow]**
 - i. **[JALITE Inc.]**
 - j. **[Jessup Manufacturing Company]**
 - k. **[Nystrom, Inc.]**
 - l. **[Zero International; Allegion plc]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[2/90 Sign Systems]**
 - b. **[Active Safety Corporation]**
 - c. **[American PERMALIGHT, Inc.]**
 - d. **[Balco; a CSW Industrials Company]**
 - e. **[Bright Path Lighting, inc.]**
 - f. **[Ecoglo, Inc.]**
 - g. **[Everglow NA, Inc.]**
 - h. **[GBC Safety Glow]**
 - i. **[JALITE Inc.]**
 - j. **[Jessup Manufacturing Company]**
 - k. **[Nystrom, Inc.]**
 - l. **[Zero International; Allegion plc]**
 - m. **<Insert manufacturer's name>**

- B. Stair-and-Landing Nosing Markings:
- Slip-resistive self-adhesive tape stripes; [1 inch (25 mm)][2 inches (51 mm)] wide.
 - Slip-resistive [1-inch- (25-mm-)][2-inch- (51-mm-)] wide stripes mounted to extruded-aluminum nosings; **with self-adhesive foam backing**.
- C. Handrail Markings: Self-adhesive **[tape][semi-rigid]** stripes; [1 inch (25 mm)][2 inches (51 mm)] wide.
- D. Floor-Mounted Perimeter Markings: Self-adhesive tape stripes; [1 inch (25 mm)][2 inches (51 mm)] wide; **with directional arrows**.
- E. Wall-Mounted Perimeter Markings:
- Self-adhesive tape stripes; [1 inch (25 mm)][2 inches (51 mm)] wide; **with directional arrows**.
 - [1-inch- (25-mm-)][2-inch- (51-mm-)] wide stripes mounted to aluminum retainer; **with directional arrows**.
- F. Obstacle Marking: Self-adhesive stripe with alternating diagonal bands of black and photoluminescent material.
- G. Door Frame Markings:
- Self-adhesive tape stripes [1 inch (25 mm)][2 inches (51 mm)] wide; **with directional arrows**.
 - [1-inch- (25-mm-)][2-inch (51-mm-)] wide stripes mounted to aluminum retainer; **with directional arrows**.
- H. Door Hardware Markings: Square **[self-adhesive sticker][rigid plastic]**, 4 inches by 4 inches (102 mm by 102 mm).
- I. Exit Signs: Rigid plastic or aluminum sign for low-level mounting, with emergency exit symbol complying with NFPA 170; **with self-adhesive backing**; with a minimum height of 4 inches (102 mm); and with running man symbol facing right or left to suit installation condition.
- J. Extruded Aluminum: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- K. Adhesive: As recommended by manufacturer.
- Adhesives shall have a VOC content of [70]<Insert value> g/L or less.
 - Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.



PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean and prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that could impair bond between photoluminescent egress path markings and wall or floor surfaces.

3.2 INSTALLATION

- A. General: Install photoluminescent egress path markings according to manufacturer's written instructions.
- B. Install aluminum nosings with adhesive and mechanical fasteners.

END OF SECTION 10 45 00 00

SECTION 10 51 13 00 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down corridor lockers.
2. Welded corridor lockers.
3. Knocked-down athletic lockers.
4. Welded athletic lockers.
5. Knocked-down, open-front athletic lockers.
6. Welded, open-front athletic lockers.
7. Locker benches.

B. Related Requirements:

1. Section 105113.13 "Coin-Operated Metal Lockers" for coin-operated lockers used in public facilities for temporary storage of personal belongings.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker **[and bench]**.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration: For each product.
3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
5. Environmental Product Declaration: For each product.
6. Environmental Product Declaration: For each product.
7. Environmental Product Declaration: For each product.
8. Third-Party Certifications: For each product.
9. Third-Party Certified Life Cycle Assessment: For each product.
10. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
11. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
12. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.



13. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
14. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

D. Samples: For each color specified, in manufacturer's standard size.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

F. Samples for Verification: For the following products, in manufacturer's standard size:

1. Lockers and equipment.
2. Locker benches.

G. Product Schedule: For lockers.[**Use same designations indicated on Drawings.**]

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. The following metal locker hardware items equal to **[10]<Insert number>** percent of amount installed for each type and finish installed, but no fewer than **[five]<Insert number>** units:
 - a. Locks.
 - b. Blank identification plates.
 - c. Hooks.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver **[master and control keys][combination control charts]** to Owner by registered mail or

overnight package service[.], **addressed as follows:**

1. **<Insert name and address of Owner's representative>.**

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of **[concrete][concrete masonry][wood]** bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 2. Damage from deliberate destruction and vandalism is excluded.
 3. Warranty Period for Knocked-Down Metal Lockers: **[Two]<Insert number>** years from date of Substantial Completion.
 4. Warranty Period for Welded Metal Lockers: **[Lifetime][10 years]<Insert years>** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain metal lockers[, **locker benches,**] and accessories from single source from single locker manufacturer.
 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers **and locker benches** indicated to be accessible, comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and][ICC A117.1]<Insert requirement>.**

2.3 KNOCKED-DOWN CORRIDOR LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Art Metal Products]**
2. **[ASI Storage Solutions]**
3. **[GSS Lockers]**
4. **[Hadrian Inc.; Zurn Industries, LLC]**
5. **[List Industries Inc.]**
6. **[LockersMFG]**
7. **[Lyon LLC]**
8. **[Olympus Lockers & Storage Products, Inc.]**
9. **[Penco Products, Inc.]**
10. **[Republic Storage Systems, LLC]**
11. **[Top Tier Storage Products]**
12. **[WEC Manufacturing LLC]**
13. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Art Metal Products]**
2. **[ASI Storage Solutions]**
3. **[GSS Lockers]**
4. **[Hadrian Inc.; Zurn Industries, LLC]**
5. **[List Industries Inc.]**
6. **[LockersMFG]**
7. **[Lyon LLC]**
8. **[Olympus Lockers & Storage Products, Inc.]**
9. **[Penco Products, Inc.]**
10. **[Republic Storage Systems, LLC]**
11. **[Top Tier Storage Products]**
12. **[WEC Manufacturing LLC]**
13. **<Insert manufacturer's name>**

- C. Doors: One piece; fabricated from **[0.060-inch (1.52-mm)][0.075-inch (1.90-mm)]** nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Doors less than **12 inches (305 mm)** wide may be fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
2. Doors for box lockers less than **15 inches (381 mm)** wide may be fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than **15 inches (381 mm)** wide; welded to inner face of doors.
4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet; welded to inner face of doors.
5. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
6. Door Style: **[Unperforated panel.][Vented panel as follows:]**

- a. Louvered Vents: No fewer than **[six louver openings at top and bottom for single-**

- tier][three louver openings at top and bottom for double-tier][two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier]<Insert configuration> lockers.
- b. Security Vents: Manufacturer's standard, stamped horizontal or vertical.
 - c. Perforated Vents: **[Manufacturer's standard shape and configuration]<Insert shape and configuration>**.
 - d. Concealed Vents: Slotted perforations in top and bottom horizontal door return flanges.
- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Intermediate Dividers: **0.024-inch (0.61-mm)** nominal thickness, with single bend at sides.
 2. Backs and Sides: **0.024-inch (0.61-mm)** nominal thickness, with full-height, double-flanged connections.
 3. Shelves: **0.024-inch (0.61-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 2. Frame Vents: Fabricate face frames with vents.
- F. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; **self-closing**.
1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum **2 inches (51 mm)** high. Provide no fewer than three hinges for each door more than **42 inches (1067 mm)** high.
 2. Continuous Hinges: Manufacturer's standard, steel, full height.
 3. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- G. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.
1. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- H. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded or riveted to full-height door strikes;

- with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- 2. Single-Point Latching: Nonmoving latch hook **[designed to engage bolt of built-in combination or cylinder lock][with steel padlock loop that projects through recessed cup and is finished to match metal locker body]**.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- I. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- J. Door Handle and Latch for 16-Person Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- K. Locks: **[Combination padlocks][Built-in combination locks][Cylinder locks][Built-in, card-operated locks][Digital keypad locks][Built-in, coin-operated locks]**.
- L. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- M. Hooks: Manufacturer's standard ball-pointed hooks, aluminum or steel; zinc plated.
- N. Coat Rods: **[1-inch- (25-mm-) diameter steel tube or rod, chrome finished][1-inch- (25-mm-) diameter steel tube or rod, nickel plated][3/4-inch- (19-mm-) diameter steel tube or rod, chrome finished][3/4-inch- (19-mm-) diameter steel tube or rod, nickel plated][Manufacturer's standard]**.
- O. Legs: **[6 inches (152 mm)]<Insert dimension>** high; formed by extending vertical frame members, or fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; welded to bottom of locker.
 - 1. Closed Front and End Bases: Fabricated from **0.036-inch (0.91-mm)** nominal-thickness steel sheet.
- P. Continuous Zee Base: Fabricated from **[0.060-inch (1.52-mm)][0.075-inch (1.90-mm)][manufacturer's standard thickness, but not less than 0.060-inch (1.52-mm)]** nominal-thickness steel sheet.
 - 1. Height: **[4 inches (102 mm)]<Insert dimension>**.
- Q. Continuous Sloping Tops: Fabricated from **[0.036-inch (0.91-mm)][0.048-inch (1.21-mm)][manufacturer's standard thickness, but not less than 0.036-inch (0.91-mm)]** nominal-thickness steel sheet.
 - 1. Closures: **[Vertical][Hipped]**-end type.
 - 2. Sloping-top corner fillers, mitered.
- R. Individual Sloping Tops: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet.
- S. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.

- T. Filler Panels: Fabricated from **[0.036-inch (0.91-mm)][0.048-inch (1.21-mm)][manufacturer's standard thickness, but not less than 0.036-inch (0.91-mm)]** nominal-thickness steel sheet.
- U. Boxed End Panels: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- V. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- W. Center Dividers: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet.
- X. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
 - 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- Y. Finish: Baked enamel or powder coat.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Two colors, with door one color and frame and body another color; as selected by Architect from manufacturer's full range]<Insert color>**.

2.4 WELDED CORRIDOR LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Art Metal Products]**
 - 2. **[ASI Storage Solutions]**
 - 3. **[DEBOURGH ALL-AMERICAN LOCKERS]**
 - 4. **[GSS Lockers]**
 - 5. **[List Industries Inc.]**
 - 6. **[LockersMFG]**
 - 7. **[Lyon LLC]**
 - 8. **[Olympus Lockers & Storage Products, Inc.]**
 - 9. **[Penco Products, Inc.]**
 - 10. **[Republic Storage Systems, LLC]**
 - 11. **[Top Tier Storage Products]**
 - 12. **[WEC Manufacturing LLC]**
 - 13. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Art Metal Products]**
 - 2. **[ASI Storage Solutions]**
 - 3. **[DEBOURGH ALL-AMERICAN LOCKERS]**
 - 4. **[GSS Lockers]**
 - 5. **[List Industries Inc.]**

6. [LockersMFG]
 7. [Lyon LLC]
 8. [Olympus Lockers & Storage Products, Inc.]
 9. [Penco Products, Inc.]
 10. [Republic Storage Systems, LLC]
 11. [Top Tier Storage Products]
 12. [WEC Manufacturing LLC]
 13. <Insert manufacturer's name>
- C. Doors: One piece; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than **15 inches (381 mm)** wide; welded to inner face of doors.
 2. Door Style: [Unperforated panel.][Vented panel as follows:]
 - a. Louvered Vents: No fewer than [six louver openings at top and bottom for single-tier][three louver openings at top and bottom for double-tier][two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier]<Insert configuration> lockers.
 - b. Security Vents: Manufacturer's standard, stamped horizontal or vertical.
 - c. Perforated Vents: [Manufacturer's standard shape and configuration]<Insert shape and configuration>.
- D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Sides: **0.060-inch (1.52-mm)** nominal thickness.
 2. Backs: **0.048-inch (1.21-mm)** nominal thickness.
 3. Shelves: **0.060-inch (1.52-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- F. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; **self-closing**.
1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum **2 inches (51 mm)** high. Provide no fewer than three hinges for each door more than **42 inches (1067 mm)** high.
 2. Continuous Hinges: Manufacturer's standard, steel, full height.
 3. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- G. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.
1. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.

2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- H. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
 2. Single-Point Latching: Nonmoving latch hook **[designed to engage bolt of built-in combination or cylinder lock][with steel padlock loop that projects through recessed cup and is finished to match metal locker body]**.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- I. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- J. Door Handle and Latch for 16-Person Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- K. Locks: **[Combination padlocks][Built-in combination locks][Cylinder locks][Built-in, card-operated locks][Digital keypad locks][Built-in, coin-operated locks]**.
- L. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- M. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- N. Coat Rods: **[1-inch- (25-mm-) diameter steel, chrome finished][1-inch- (25-mm-) diameter steel, nickel plated][3/4-inch- (19-mm-) diameter steel, chrome finished][3/4-inch- (19-mm-) diameter steel, nickel plated][Manufacturer's standard]**.
- O. Legs: **[6 inches (152 mm)]<Insert dimension>** high; formed by extending vertical frame members, or fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; welded to bottom of locker.
1. Closed Front and End Bases: Fabricated from **0.036-inch (0.91-mm)** nominal-thickness steel sheet.
- P. Continuous Zee Base: Fabricated from, **[0.060-inch (1.52-mm)][0.075-inch (1.90-mm)][manufacturer's standard thickness, but not less than 0.060-inch (1.52-mm)]** nominal-thickness steel sheet.

1. Height: **[4 inches (102 mm)]<Insert dimension>**.

Q. Continuous Sloping Tops: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: **[Vertical][Hipped]**-end type.

R. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.

S. Filler Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.

T. Boxed End Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.

U. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

V. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.

W. Finish: Baked enamel or powder coat.

1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Two colors, with door one color and frame and body another color; as selected by Architect from manufacturer's full range]<Insert color>**.

2.5 KNOCKED-DOWN ATHLETIC LOCKERS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Art Metal Products]**
2. **[ASI Storage Solutions]**
3. **[GSS Lockers]**
4. **[Hadrian Inc.; Zurn Industries, LLC]**
5. **[List Industries Inc.]**
6. **[LockersMFG]**
7. **[Lyon LLC]**
8. **[Olympus Lockers & Storage Products, Inc.]**
9. **[Penco Products, Inc.]**
10. **[Republic Storage Systems, LLC]**
11. **[Top Tier Storage Products]**
12. **[WEC Manufacturing LLC]**
13. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's**

name; product name or designation> or comparable product by one of the following:

1. **[Art Metal Products]**
 2. **[ASI Storage Solutions]**
 3. **[GSS Lockers]**
 4. **[Hadrian Inc.; Zurn Industries, LLC]**
 5. **[List Industries Inc.]**
 6. **[LockersMFG]**
 7. **[Lyon LLC]**
 8. **[Olympus Lockers & Storage Products, Inc.]**
 9. **[Penco Products, Inc.]**
 10. **[Republic Storage Systems, LLC]**
 11. **[Top Tier Storage Products]**
 12. **[WEC Manufacturing LLC]**
 13. **<Insert manufacturer's name>**
- C. Perforated Doors: One piece; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at **[vertical edges and with right-angle single bend at horizontal edges][and][latch point (bottom) and right-angle single bend at remaining edges for box lockers]**.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than **15 inches (381 mm)** wide; welded to inner face of doors.
- D. Expanded-Metal Doors: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angle frame; with **0.090-inch (2.28-mm)** nominal-thickness, steel sheet lock panel backed by **0.060-inch (1.52-mm)** nominal-thickness, steel sheet retainer welded to door frame.
- E. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: **0.060-inch (1.52-mm)** nominal thickness, with single bend at edges.
 2. Backs: **0.048-inch (1.21-mm)** nominal thickness.
 3. Shelves: **0.060-inch (1.52-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- F. Unperforated Sides: Fabricated from **[0.048-inch (1.21-mm)][0.060-inch (1.52-mm)]** nominal-thickness steel sheet.
- G. Perforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- H. Expanded-Metal Sides: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angles or **0.060-inch (1.52-mm)** nominal-thickness steel channel frames.
- I. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet or **0.097-inch (2.45-mm)** nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 2. Cross Frames for Triple-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

- J. Reinforced Bottoms: Structural channels, formed from **[0.060-inch (1.52-mm)][0.075-inch (1.90-mm)]** nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- K. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees[; **self-closing**].
 - 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum **2 inches (51 mm)** high. Provide no fewer than three hinges for each door more than **42 inches (1067 mm)** high.
 - 2. Continuous Hinges: Manufacturer's standard, steel; side or top mounted as required by locker configuration.
 - 3. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- L. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
 - 2. Single-Point Latching: Nonmoving latch hook **[designed to engage bolt of built-in combination or cylinder lock][with steel padlock loop that projects through recessed cup and is finished to match metal locker body]**.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- M. Projecting Turn-Handle and Latch: Steel handle welded to manufacturer's standard, three-point, cremone-type latching mechanism consisting of steel rods or bars that engage locker frame at top and bottom of door, and center latch that engages strike jamb; with steel padlock loop.
- N. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- O. Locks: **[Combination padlocks][Built-in combination locks][Cylinder locks][Built-in, card-operated locks][Digital keypad locks][Built-in, coin-operated locks]**.
- P. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- Q. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- R. Coat Rods: **[1-inch- (25-mm-) diameter steel, chrome finished][1-inch- (25-mm-) diameter steel, nickel plated][3/4-inch- (19-mm-) diameter steel, chrome finished][3/4-inch- (19-mm-) diameter steel, nickel plated][Manufacturer's standard]**.

- S. Legs: **[6 inches (152 mm)]<Insert dimension>** high; formed by extending vertical frame members, or fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet;
 - 1. Closed Front and End Bases: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- T. Continuous Zee Base: **4 inches (102 mm)** high; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet.
- U. Continuous Sloping Tops: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: **[Vertical][Hipped]**-end type.
- V. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- W. Filler Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- X. Boxed End Panels: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- Y. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- Z. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
 - 3. Expanded Metal: ASTM F1267, Type II (flattened), Class I (uncoated), **3/4-inch (19-mm)** steel mesh, with at least 70 percent open area.
 - 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- AA. Finish: Baked enamel or powder coat.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Two colors, with door one color and frame and body another color; as selected by Architect from manufacturer's full range]<Insert color>**.

2.6 WELDED ATHLETIC LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Art Metal Products]**
 - 2. **[ASI Storage Solutions]**
 - 3. **[DEBOURGH ALL-AMERICAN LOCKERS]**
 - 4. **[GSS Lockers]**
 - 5. **[List Industries Inc.]**
 - 6. **[LockersMFG]**
 - 7. **[Lyon LLC]**

8. [Olympus Lockers & Storage Products, Inc.]
 9. [Penco Products, Inc.]
 10. [Republic Storage Systems, LLC]
 11. [Top Tier Storage Products]
 12. [WEC Manufacturing LLC]
 13. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Art Metal Products]
 2. [ASI Storage Solutions]
 3. [DEBOURGH ALL-AMERICAN LOCKERS]
 4. [GSS Lockers]
 5. [List Industries Inc.]
 6. [LockersMFG]
 7. [Lyon LLC]
 8. [Olympus Lockers & Storage Products, Inc.]
 9. [Penco Products, Inc.]
 10. [Republic Storage Systems, LLC]
 11. [Top Tier Storage Products]
 12. [WEC Manufacturing LLC]
 13. <Insert manufacturer's name>
- C. Perforated Doors: One piece; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at [vertical edges and with right-angle single bend at horizontal edges][and][latch point (bottom) and right-angle single bend at remaining edges for box lockers].
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than **15 inches (381 mm)** wide; welded to inner face of doors.
- D. Expanded-Metal Doors: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angle frame; with **0.090-inch (2.28-mm)** nominal-thickness, steel sheet lock panel backed by **0.060-inch (1.52-mm)** nominal-thickness, steel sheet retainer welded to door frame.
- E. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: **0.060-inch (1.52-mm)** nominal thickness, with single bend at edges.
 2. Backs: **0.048-inch (1.21-mm)** nominal thickness.
 3. Shelves: **0.060-inch (1.52-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- F. Unperforated Sides: Fabricated from [**0.048-inch (1.21-mm)**][**0.060-inch (1.52-mm)**] nominal-thickness steel sheet.
- G. Perforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- H. Expanded-Metal Sides: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angles or **0.060-inch (1.52-mm)** nominal-thickness steel channel frames.

- I. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet or **0.097-inch (2.45-mm)** nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
 1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 2. Cross Frames for Triple-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- J. Reinforced Bottoms: Structural channels, formed from **[0.060-inch (1.52-mm)][0.075-inch (1.90-mm)]** nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- K. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; **self-closing**.
 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum **2 inches (51 mm)** high. Provide no fewer than three hinges for each door more than **42 inches (1067 mm)** high.
 2. Continuous Hinges: Manufacturer's standard, steel; side or top mounted as required by locker configuration.
 3. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- L. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
 2. Single-Point Latching: Nonmoving latch hook **[designed to engage bolt of built-in combination or cylinder lock][with steel padlock loop that projects through recessed cup and is finished to match metal locker body]**.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from **0.120-inch (3.04-mm)** nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- M. Projecting Turn-Handle and Latch: Steel handle welded to manufacturer's standard, three-point, cremone-type latching mechanism consisting of steel rods or bars that engage locker frame at top and bottom of door, and center latch that engages strike jamb; with steel padlock loop.
- N. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- O. Locks: **[Combination padlocks][Built-in combination locks][Cylinder locks][Built-in, card-operated locks][Digital keypad locks][Built-in, coin-operated locks]**.

- P. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- Q. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- R. Coat Rods: **[1-inch- (25-mm-) diameter steel, chrome finished][1-inch- (25-mm-) diameter steel, nickel plated][3/4-inch- (19-mm-) diameter steel, chrome finished][3/4-inch- (19-mm-) diameter steel, nickel plated][Manufacturer's standard]**.
- S. Legs: **[6 inches (152 mm)]<Insert dimension>** high; formed by extending vertical frame members, or fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; welded to bottom of locker.
 - 1. Closed Front and End Bases: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- T. Continuous Zee Base: **4 inches (102 mm)** high; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet.
- U. Continuous Sloping Tops: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: **[Vertical][Hipped]**-end type.
- V. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- W. Filler Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- X. Boxed End Panels: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- Y. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- Z. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
 - 3. Expanded Metal: ASTM F1267, Type II (flattened), Class I (uncoated), **3/4-inch (19-mm)** steel mesh, with at least 70 percent open area.
 - 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- AA. Finish: Baked enamel or powder coat.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Two colors, with door one color and frame and body another color; as selected by Architect from manufacturer's full range]<Insert color>**.

2.7 KNOCKED-DOWN, OPEN-FRONT ATHLETIC LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Art Metal Products]**
 2. **[ASI Storage Solutions]**
 3. **[Hadrian Inc.; Zurn Industries, LLC]**
 4. **[List Industries Inc.]**
 5. **[LockersMFG]**
 6. **[Lyon LLC]**
 7. **[Olympus Lockers & Storage Products, Inc.]**
 8. **[Penco Products, Inc.]**
 9. **[Republic Storage Systems, LLC]**
 10. **[Top Tier Storage Products]**
 11. **[WEC Manufacturing LLC]**
 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Art Metal Products]**
 2. **[ASI Storage Solutions]**
 3. **[Hadrian Inc.; Zurn Industries, LLC]**
 4. **[List Industries Inc.]**
 5. **[LockersMFG]**
 6. **[Lyon LLC]**
 7. **[Olympus Lockers & Storage Products, Inc.]**
 8. **[Penco Products, Inc.]**
 9. **[Republic Storage Systems, LLC]**
 10. **[Top Tier Storage Products]**
 11. **[WEC Manufacturing LLC]**
 12. **<Insert manufacturer's name>**
- C. Locker Arrangement: Open front, with **[seat/shelf][seat/footlocker][upper shelf][upper shelf with security box][and][full-width security compartment][configuration as indicated on Drawings]**.
- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: **0.060-inch (1.52-mm)** nominal thickness, with single bend at edges.
 2. Backs: **0.048-inch (1.21-mm)** nominal thickness.
 3. Shelves: **0.060-inch (1.52-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- E. Unperforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- F. Perforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations. Perforations not to occur **[above upper shelf][at security compartment][or][at seat/footlocker]**.
- G. Expanded-Metal Sides: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angles or **0.060-inch (1.52-mm)** nominal-thickness steel channel frames.

- H. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet or **0.105-inch (2.66-mm)** nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames.
- I. Reinforced Bottoms: Structural channels, formed from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- J. Seats/Shelves: Full width of metal locker; channel formed; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; with stiffeners for reinforcement.
- K. Seats/Footlockers: Enclosure full width of bottom of metal locker; fabricated from cold-rolled steel sheet.
 - 1. Seat/Lid: **0.075-inch (1.90-mm)** nominal-thickness steel sheet; channel formed and reinforced with stiffeners; with manufacturer's standard, steel continuous hinge that is completely concealed and tamper resistant when seat/lid is closed; with padlock hasp.
 - 2. Front Panel: **0.075-inch (1.90-mm)** nominal-thickness steel sheet; channel formed at top edge; with minilouvers for ventilation; recessed for padlock loop.
 - 3. Sides: **[Integral part of unperforated][Unperforated bottom portions of perforated][0.060-inch (1.52-mm) nominal-thickness steel sheet inside expanded-metal]** sides.
- L. Security Boxes: Nonperforated, consisting of partition extending from upper shelf to top of metal locker, fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; with channel-formed, **0.060-inch (1.52-mm)** nominal-thickness, steel sheet door frame, and door fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet with right-angle single bend at edges; with manufacturer's standard, steel continuous hinge that is completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - 1. Single-Point Latching: Stainless steel strike plate with integral pull; with steel, nonmoving latch hook **[designed to engage bolt of lock][with steel padlock loop that projects through door and is finished to match metal locker body]**.
 - 2. Locks: **[Combination padlocks][Built-in combination locks]<Insert item>**.
- M. Security Compartments: Nonperforated, running full width of metal locker, with door fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet.
 - 1. Locks: **[Combination padlocks][Built-in combination locks]<Insert item>**.
- N. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- O. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- P. Coat Rods: **[1-inch- (25-mm-) diameter steel, chrome finished][1-inch- (25-mm-) diameter steel, nickel plated][3/4-inch- (19-mm-) diameter steel, chrome finished][3/4-inch- (19-mm-) diameter steel, nickel plated][Manufacturer's standard]**.
- Q. Continuous Sloping Tops: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: **[Vertical][Hipped]**-end type.
- R. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- S. Filler Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.

- T. Boxed End Panels: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- U. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- V. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
 - 3. Expanded Metal: ASTM F1267, Type II (flattened), Class I (uncoated), **3/4-inch (19-mm)** steel mesh, with at least 70 percent open area.
 - 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- W. Finish: Baked enamel or powder coat.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.

2.8 WELDED, OPEN-FRONT ATHLETIC LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Art Metal Products]**
 - 2. **[ASI Storage Solutions]**
 - 3. **[DEBOURGH ALL-AMERICAN LOCKERS]**
 - 4. **[List Industries Inc.]**
 - 5. **[LockersMFG]**
 - 6. **[Lyon LLC]**
 - 7. **[Olympus Lockers & Storage Products, Inc.]**
 - 8. **[Penco Products, Inc.]**
 - 9. **[Republic Storage Systems, LLC]**
 - 10. **[Top Tier Storage Products]**
 - 11. **[WEC Manufacturing LLC]**
 - 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Art Metal Products]**
 - 2. **[ASI Storage Solutions]**
 - 3. **[DEBOURGH ALL-AMERICAN LOCKERS]**
 - 4. **[List Industries Inc.]**
 - 5. **[LockersMFG]**
 - 6. **[Lyon LLC]**
 - 7. **[Olympus Lockers & Storage Products, Inc.]**
 - 8. **[Penco Products, Inc.]**
 - 9. **[Republic Storage Systems, LLC]**
 - 10. **[Top Tier Storage Products]**
 - 11. **[WEC Manufacturing LLC]**

12. <Insert manufacturer's name>

- C. Locker Arrangement: Open front, with [seat/shelf][seat/footlocker][upper shelf][upper shelf with security box][and][full-width security compartment][configuration as indicated on Drawings].
- D. Material: [Cold-rolled][Metallic-coated] steel sheet.
- E. Body: Assembled by [welding][or][riveting or bolting] body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: **0.060-inch (1.52-mm)** nominal thickness, with single bend at edges.
 - 2. Backs: **0.048-inch (1.21-mm)** nominal thickness.
 - 3. Shelves: **0.060-inch (1.52-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- F. Unperforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- G. Perforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet with manufacturer's standard diamond perforations. Perforations not to occur [above upper shelf][at security compartment][or][at seat/footlocker].
- H. Expanded-Metal Sides: Fabricated from **0.090-inch (2.28-mm)** nominal-thickness expanded metal; welded to **0.105-inch (2.66-mm)** nominal-thickness steel angles or **0.060-inch (1.52-mm)** nominal-thickness steel channel frames.
- I. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet or **0.105-inch (2.66-mm)** nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames.
- J. Reinforced Bottoms: Structural channels, formed from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- K. Seats/Shelves: Full width of metal locker; channel formed; fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet; with stiffeners for reinforcement.
- L. Seats/Footlockers: Enclosure full width of bottom of metal locker; fabricated from cold-rolled steel sheet.
 - 1. Seat/Lid: **0.075-inch (1.90-mm)** nominal-thickness steel sheet; channel formed and reinforced with stiffeners; with manufacturer's standard, steel continuous hinge that is completely concealed and tamper resistant when seat/lid is closed; with padlock hasp.
 - 2. Front Panel: **0.075-inch (1.90-mm)** nominal-thickness steel sheet; channel formed at top edge; with minilouvers for ventilation; recessed for padlock loop.
 - 3. Sides: [Integral part of unperforated][Unperforated bottom portions of perforated][**0.060-inch (1.52-mm)** nominal-thickness steel sheet inside expanded-metal] sides.
- M. Security Boxes: Nonperforated, consisting of partition extending from upper shelf to top of metal locker, fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; with channel-formed, **0.060-inch (1.52-mm)** nominal-thickness, steel sheet door frame, and door fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet with right-angle single bend at edges; with manufacturer's standard, steel continuous hinge that is completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - 1. Single-Point Latching: Stainless steel strike plate with integral pull; with steel, nonmoving latch hook [designed to engage bolt of lock][with steel padlock loop that projects through door and is finished to match metal locker body].

2. Locks: **[Combination padlocks][Built-in combination locks]<Insert item>**.
- N. Security Compartments: Nonperforated, running full width of metal locker, with door fabricated from **0.075-inch (1.90-mm)** nominal-thickness steel sheet.
1. Locks: **[Combination padlocks][Built-in combination locks]<Insert item>**.
- O. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **[aluminum][plastic]** plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- P. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- Q. Coat Rods: **[1-inch- (25-mm-) diameter steel, chrome finished][1-inch- (25-mm-) diameter steel, nickel plated][3/4-inch- (19-mm-) diameter steel, chrome finished][3/4-inch- (19-mm-) diameter steel, nickel plated][Manufacturer's standard]**.
- R. Continuous Sloping Tops: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
1. Closures: **[Vertical][Hipped]**-end type.
- S. Recess Trim: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- T. Filler Panels: Fabricated from **0.048-inch (1.21-mm)** nominal-thickness steel sheet.
- U. Boxed End Panels: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- V. Finished End Panels: Fabricated from **0.024-inch (0.61-mm)** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- W. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
 3. Expanded Metal: ASTM F1267, Type II (flattened), Class I (uncoated), **3/4-inch (19-mm)** steel mesh, with at least 70 percent open area.
 4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- X. Finish: Baked enamel or powder coat.
1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- 2.9 LOCKS
- A. Combination Padlock: **[Key-controlled, three-number dialing combination locks; capable of five combination changes][Provided by Owner]**.
- B. Built-in Combination Lock: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.



1. Bolt Operation: **[Manually locking deadbolt][or][automatically locking spring bolt]**.
- C. Cylinder Lock: Built-in, flush, cam lock with five-pin tumbler keyway, keyed separately and master keyed. Furnish two change keys for each lock and **[two]<Insert number>** master keys.
 1. Key Type: **[Flat][Grooved]**, with minimum 2- by 2.68-inch (51- by 68.3-mm) key head for accessible lockers].
 2. Bolt Operation: **[Manually locking deadbolt][or][automatically locking spring bolt]**.
- D. Built-in, Card-Operated Lock: Self-contained units mounted on interior of door with replaceable lock cylinders keyed separately and master keyed. Mount instruction decals on both door faces. Furnish one change card key for each lock and one master card key.
 1. Bolt Operation: **[Manually locking deadbolt][or][automatically locking spring bolt]**.
- E. Digital Keypad Lock: Battery-powered electronic keypad with reprogrammable manager and owner codes that override access. Three consecutive incorrect code entries will disable lock for three minutes.
 1. Designed for permanently assigned access via entry of user's four-digit code.
 2. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock. Provide LED indicator to show when lock is in use.
- F. Built-in, Coin-Operated Lock: Self-contained units mounted on interior of door with replaceable lock cylinders keyed separately and master keyed. Mount instruction decals on both door faces. Furnish one change key for each lock and one master key.
 1. Bolt Operation: **[Manually locking deadbolt][or][automatically locking spring bolt]**.
 2. Lock Type: Fee **[return/deposit][collect/pay]**.
 3. Fee Type: **[Token][Coin, one quarter][Coin, two quarters]**.
 4. Coin Box: Manufacturer's standard housing or stainless steel cash box with stainless steel flanged cover set into base of lock channel frame. Furnish with removable cylinder and key, and master code changer key.

2.10 LOCKER BENCHES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Art Metal Products]**
 2. **[ASI Storage Solutions]**
 3. **[Hadrian Inc.; Zurn Industries, LLC]**
 4. **[List Industries Inc.]**
 5. **[Lyon LLC]**
 6. **[Penco Products, Inc.]**
 7. **[Top Tier Storage Products]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Art Metal Products]**
 2. **[ASI Storage Solutions]**
 3. **[Hadrian Inc.; Zurn Industries, LLC]**

4. [List Industries Inc.]
 5. [Lyon LLC]
 6. [Penco Products, Inc.]
 7. [Top Tier Storage Products]
 8. <Insert manufacturer's name>
- C. Provide bench units with overall assembly height of [17-1/2 inches (445 mm)]<Insert dimension>.
- D. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick (241 mm wide by 32 mm thick)[except provide 20- to 24-inch- (508- to 610-mm-) wide tops where accessible benches are indicated].
 2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
 3. Plastic laminate over particleboard core, with two steel tubes running full length of top and positioned to receive pedestal fasteners.
 - a. Color: [Match metal lockers][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
 4. Extruded aluminum with clear anodic finish.
- E. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
1. Tubular Steel:
 - a. 1-1/2-inch- (38-mm-) diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
 - b. 1-1/4-inch- (32-mm-) diameter steel tubing, with 0.1265-inch- (3.2-mm-) thick steel flanges welded at top and base; with [baked-enamel][zinc-plated] finish; anchored with exposed fasteners.
 - c. Color: [Match metal lockers][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
- F. Movable-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top, complete with fasteners, and as follows:
1. Aluminum: 1/8-inch-thick by 3-inch-wide (3-mm-thick by 76-mm-wide) channel or 1/4-inch-thick by 3-inch-wide (6-mm-thick by 76-mm-wide) bar stock, shaped into [trapezoidal][inverted-T] form; with nonskid pads at bottom.
 - a. Finish: [Clear][Black][Gold] anodic finish.
 2. Stainless Steel: 1/8-inch-thick by 3-inch-wide (3-mm-thick by 76-mm-wide) channel or 1/4-inch-thick by 3-inch-wide (6-mm-thick by 76-mm-wide) bar stock, shaped into trapezoidal form; with nonskid pads at bottom.
 - a. Finish: [Manufacturer's standard][No. 4B].
- G. Materials:
1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
 2. Plastic Laminate: ISO 4586-3, Grade HGP.

3. Extruded Aluminum: **ASTM B221 (ASTM B221M)**, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
4. Steel Tube: ASTM A500/A500M, cold rolled.
5. Composite Wood Products: Products shall be made without urea formaldehyde.
6. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
7. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
8. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
9. Composite Wood Products: Products shall be made without urea formaldehyde.
10. Particleboard: ANSI A208.1, Grade M-2.

2.11 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 3. Triple-Tier Units: One double-prong ceiling hook.
 4. Coat Rods: **[As indicated on Drawings][For each compartment of each locker][In lieu of ceiling hook for metal lockers 24 inches (610 mm) high or more][In lieu of ceiling hook for metal lockers 18 inches (457 mm) deep or more]**.
 5. Open-Front Athletic Lockers: Two single-prong wall hooks bolted to locker back and coat rod.
- D. Knocked-Down Construction: Fabricate metal lockers by **[assembling at Project site][preassembling at plant prior to shipping]**, using manufacturer's nuts, bolts, screws, or rivets.
- E. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.
- F. Accessible Lockers: Fabricate as follows:
 1. Locate bottom shelf no lower than **15 inches (381 mm)** above the floor.

2. Where hooks, coat rods, or additional shelves are provided, locate no higher than **48 inches (1219 mm)** above the floor.

- G. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.
- H. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 1. Sloping-top corner fillers, mitered.
- I. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.
- J. Recess Trim: Fabricated with minimum **2-1/2-inch (64-mm)** face width and in lengths as long as practical; finished to match lockers.
- K. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- L. Boxed End Panels: Fabricated with **1-inch- (25-mm-)** wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- M. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- N. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.12 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls[, and elsewhere as indicated,] for corrosion resistance.
 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than **36 inches (910 mm)** o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top [**and bottom of lockers**][**of lockers and to floor**].
 - 3. Anchor back-to-back metal lockers to floor.
- B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- D. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- E. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 - 5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.
- F. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than **72 inches (1830 mm)** apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.
- G. Movable Benches: Place benches in locations indicated on Drawings.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.[**Verify that integral locking devices operate properly.**]



3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13 00



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SECTION 10 51 13 00A - WIRE MESH STORAGE LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Woven wire mesh storage lockers.
 - 2. Welded wire mesh storage lockers.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - b. **<Insert requirements>**.
- B. Shop Drawings:
 - 1. Plans, elevations, sections, and attachment details.
 - 2. **<Insert requirements>**.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of wire mesh storage locker with factory-applied color finishes.
- D. Samples for Verification: Actual sample of finished products for each type of wire mesh storage locker with factory-applied color finishes.
 - 1. Size: **[Manufacturers' standard size]<Insert size>**.
- E. Delegated Design Submittals: For seismic restraint of wire mesh storage lockers, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Qualification Statements: For Installer.
- C. Delegated design engineer qualifications.



1.4 QUALITY ASSURANCE

- A. Installer Qualifications: **[Fabricator of products][Entity that employs installers and supervisors who are trained and approved by manufacturer][Authorized representative who is trained and approved by manufacturer].**
- B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in **[state]<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh storage lockers **[with cardboard protectors on perimeters of panels and doors and with posts wrapped][palletted][crated]** to provide protection during transit and Project-site storage. Use vented plastic.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh storage lockers by field measurements and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Regulations: Comply with applicable provisions in **[the DOJ's "2010 ADA Standards for Accessible Design"]****[and][ICC A117.1]<Insert accessibility regulation>** for wire mesh storage lockers designated as accessible.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraint of wire mesh storage lockers.
- C. Seismic Performance: Wire mesh storage lockers to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.

2.2 WOVEN WIRE MESH STORAGE LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[California Wire Products Corporation]**
 - 2. **[Jesco Industries, Inc.]**

3. [Kenco Wire & Iron Products Inc.]
 4. [Newark Wire Works Inc]
 5. [SpaceGuard Products]
 6. [Standard Wire & Steel Works]
 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [California Wire Products Corporation]
 2. [Jesco Industries, Inc.]
 3. [Kenco Wire & Iron Products Inc.]
 4. [Newark Wire Works Inc]
 5. [SpaceGuard Products]
 6. [Standard Wire & Steel Works]
 7. <Insert manufacturer's name>
- C. Woven Wire Mesh: 10-gauge, intermediate-crimp steel wire woven into [1-1/2-inch (38-mm) diamond][1-by-2-inch (25-by-50-mm) rectangular][1-1/2-inch (38-mm) diamond or 1-by-2-inch (25-by-50-mm) rectangular] mesh.
- D. Locker Configuration: [Single][Double][Triple] tier.
- E. Unit Sizes:
1. Width: [36 inches (914 mm)][48 inches (1219 mm)]<Insert dimension>.
 2. Depth: [36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)]<Insert dimension>.
 3. Height: [90 inches (2286 mm)]<Insert dimension> total.
- F. Wall Panels: Woven wire mesh welded to manufacturer's standard 1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3-mm) steel angle framing.
1. Horizontal Panel Stiffeners: Manufacturer's standard.
- G. Back Panels: [Fabricated from same mesh and framing as wall panels][18-gauge, metallic-coated steel sheet][20-gauge, metallic-coated steel sheet][Manufacturer's standard metallic-coated steel sheet back panel]. Required for [back-to-back units only][all units, including those attached to walls].
- H. Ceiling Panels: Fabricated from same mesh and framing as wall panels.
- I. Horizontal Dividers: [16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet divider][As required for load capacity indicated]<Insert requirements>.[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners].
1. Load Capacity: [250 lb (113 kg)][As indicated on Drawings]<Insert load>, uniformly distributed.
- J. Shelves: [16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet shelf][As required for load capacity indicated]<Insert requirements>.[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners].
1. Load Capacity: [250 lb (113 kg)][As indicated on Drawings]<Insert load>, uniformly distributed.
- K. Floor Panels: [16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet floor panel][As required for load capacity indicated]<Insert requirements>.[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners].

1. Load Capacity: **[250 lb (113 kg)]****[As indicated on Drawings]****<Insert load>**, uniformly distributed.

L. Doors: Fabricated from same mesh and framing as wall panels.

1. Locking Device: **[Padlock hasp]****<Insert requirements>**.
2. Stiffener for Single-Tier Doors: **1/2-inch- (13-mm-) diameter steel rods or 3/4-by-1/4-inch (19-by-6-mm) steel flat bars, diagonal from center of door to corners.**
3. Stiffener for Double- or Triple-Tier Doors: **[1/2-inch- (13-mm-) diameter steel rod or 3/4-by-1/4-inch (19-by-6-mm) steel flat bars, diagonal from center of door to corners]****[One diagonal 1/2-inch (13-mm) diameter steel rod or 3/4-by-1/4-inch (19-by-6-mm) steel flat bar from corner to corner of door]****[Manufacturer's standard].**
4. Hinges: Full-surface type, **2-1/2-by-2-1/2-inch (64-by-64-mm) steel, [1-1/2 pairs per single-tier door]****[and]****[1 pair per double- or triple-tier door];** welded to door and jamb framing.

M. Finish for Uncoated Ferrous Steel: **[Hot-dip galvanized]****[Hot-dip galvanized and shop primed for field painting]****[Shop primed for field painting]****[Enamel finish]****[TGIC polyester powder-coated finish]****[HAA polyester powder-coated finish]****[Epoxy powder-coated finish]****[Polyester/epoxy hybrid powder-coated finish]****[Manufacturer's standard powder-coated finish]** unless otherwise indicated.

1. Color: **[As indicated by manufacturer's designations]****[Match Architect's samples]****[As selected by Architect from manufacturer's full range]****<Insert color>**.

2.3 WELDED WIRE MESH STORAGE LOCKERS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[California Wire Products Corporation]**
2. **[Folding Guard, Incorporated]**
3. **[Kenco Wire & Iron Products Inc.]**
4. **[Major Partitions]**
5. **[Newark Wire Works Inc]**
6. **[SecurityCaging.com; International Vault, Inc.]**
7. **[SpaceGuard Products]**
8. **[Standard Wire & Steel Works]**
9. **[WireCrafters, LLC]**
10. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[California Wire Products Corporation]**
2. **[Folding Guard, Incorporated]**
3. **[Kenco Wire & Iron Products Inc.]**
4. **[Major Partitions]**
5. **[Newark Wire Works Inc]**
6. **[SecurityCaging.com; International Vault, Inc.]**
7. **[SpaceGuard Products]**
8. **[Standard Wire & Steel Works]**
9. **[WireCrafters, LLC]**
10. **<Insert manufacturer's name>**

C. Welded Wire Mesh: **[10-gauge]****<Insert size>**, steel wire welded into **[2-by-2-inch (50-by-50-mm)]**

square]<Insert pattern> mesh.

- D. Locker Configuration: **[Single][Double][Triple]** tier.
- E. Unit Sizes:
1. Width: **[36 inches (914 mm)][48 inches (1219 mm)]<Insert dimension>**.
 2. Depth: **[36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)]<Insert dimension>**.
 3. Height: **[90 inches (2286 mm)]<Insert dimension>** total.
- F. Wall Panels: Welded wire mesh welded to manufacturer's standard **1-1/4-by-1-1/4-by-1/8-inch (32-by-32-by-3-mm)** steel angle framing.
1. Horizontal Panel Stiffeners: Manufacturer's standard.
- G. Back Panels: **[Fabricated from same mesh and framing as wall panels][18-gauge, metallic-coated steel sheet][20-gauge, metallic-coated steel sheet][Manufacturer's standard metallic-coated steel sheet back panel]**. Required for **[back-to-back units only][all units, including those attached to walls]**.
- H. Ceiling Panels: Fabricated from same mesh and framing as wall panels.
- I. Horizontal Dividers: **[16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet divider][2-gauge, steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][6-gauge steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][Manufacturer's standard welded wire mesh divider][As required for load capacity indicated]<Insert requirements>**.**[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners]**.
1. Load Capacity: **[250 lb (113 kg)][As indicated on Drawings]<Insert load>**, uniformly distributed.
- J. Shelves: **[16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet shelf][2-gauge, steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][6-gauge, steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][Manufacturer's standard welded wire mesh shelf][As required for load capacity indicated]<Insert requirements>**.**[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners]**.
1. Load Capacity: **[250 lb (113 kg)][As indicated on Drawings]<Insert load>**, uniformly distributed.
- K. Floor Panels: **[16-gauge, metallic-coated steel sheet with flanged edges][Manufacturer's standard metallic-coated steel sheet floor panel][2-gauge, steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][6-gauge, steel wire welded into 2-by-2-inch (50-mm-by-50-mm) square mesh, with same framing as wall panels][Manufacturer's standard welded wire mesh floor panel][As required for load capacity indicated]<Insert requirements>**.**[Reinforce across width with 3/4-by-1/4-inch (19-by-6-mm) steel stiffeners]**.
1. Load Capacity: **[250 lb (113 kg)][As indicated on Drawings]<Insert load>**, uniformly distributed.
- L. Doors: Fabricated from same mesh and framing as wall panels.
1. Locking Device: **[Padlock hasp]<Insert requirements>**.
 2. Stiffener for Single-Tier Doors: **1/2-inch- (13-mm-) diameter steel rods or 3/4-by-1/4-inch (19-by-6-mm) steel flat bars, diagonal from center of door to corners.**
 3. Stiffener for Double- or Triple-Tier Doors: **[1/2-inch- (13-mm-) diameter steel rod or 3/4-by-1/4-inch (19-by-6-mm) steel flat bars, diagonal from center of door to corners][One diagonal**

1/2-inch (13-mm) diameter steel rod or 3/4-by-1/4-inch (19-by-6-mm) steel flat bar from corner to corner of door[Manufacturer's standard].

4. Hinges: Full-surface type, 2-1/2-by-2-1/2-inch (64-by-64-mm) steel, [1-1/2 pairs per single-tier door][and][1 pair per double- or triple-tier door]; welded to door and jamb framing.

M. Finish for Uncoated Ferrous Steel: [Hot-dip galvanized][Hot-dip galvanized and shop primed for field painting][Shop primed for field painting][Enamel finish][TGIC polyester powder-coated finish][HAA polyester powder-coated finish][Epoxy powder-coated finish][Polyester/epoxy hybrid powder-coated finish][Manufacturer's standard powder-coated finish] unless otherwise indicated.

1. Color: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert color>.

2.4 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- B. Steel Wire: ASTM A510/A510M.
- C. Steel Plates, Channels, Angles, and Bars: ASTM A36/A36M.
- D. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M, Commercial Steel (CS), Type B.
- E. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
- F. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.
- G. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
 1. Material: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
- H. Power-Driven Fasteners: ICC-ES AC70.
- I. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."
- J. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- K. Zinc-Rich Primer: Compatible with topcoat, complying with SSPC-Paint 20 or SSPC-Paint 29.
- L. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.5 FABRICATION

- A. General: Fabricate wire mesh storage lockers from components of sizes not less than those indicated. Use larger size components as recommended by wire mesh manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh storage lockers to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and **[grind smooth, leaving no evidence of joint][finish sand][remove spatter][leave as applied]**.
- B. Wire Mesh Storage Lockers: Fabricate initial storage locker with front and two sides. Fabricate additional storage lockers **[similarly, so each unit is independent][as add-on units designed to share one side with initial storage locker]**.
 - 1. Fabricate wall panel and door framing with slotted holes for connecting adjacent panels.
 - 2. Prehang doors in factory.
- C. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than **15 inches (381 mm)** above the floor.
 - 2. Where additional shelves are provided, locate no higher than **48 inches (1219 mm)** above the floor.

2.6 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean items of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Preparation for Shop Priming: Prepare surfaces to comply with **[SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."]****[SSPC-SP 3, "Power Tool Cleaning."]**
- D. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
- E. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- F. Enamel Finish: Complying with AAMA 2603.
- G. Powder-Coat Finish: Complying with AAMA 2603.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and

other conditions affecting performance of the Work.

- B. Examine floors for suitable conditions where wire mesh storage lockers will be installed.
- C. Examine walls to which wire mesh storage lockers will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Anchor wire mesh storage lockers to floor with **3/8-inch- (9.5-mm-)** diameter expansion anchors at **12 inches (305 mm)** o.c. through bottom panel framing. Shim panel framing as required to achieve level and plumb installation.
 - 1. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- B. Anchor wire mesh storage lockers to walls at **12 inches (305 mm)** o.c. through back corner panel framing and as follows:
 - 1. For concrete and solid masonry anchorage, use expansion anchors.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
- C. Attach adjacent wire mesh storage lockers to each other through side panel framing.
- D. Install dividers/shelving/floor panels/ceiling panels as required.
- E. Install doors complete with door hardware.
- F. Install seismic restraints.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily without binding or warping. Adjust hardware to function smoothly. Confirm that hasps engage accurately and securely without forcing or binding.
- B. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.
- C. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop

paint are specified in Section 099123 "Interior Painting."

- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 10 51 13 00A



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Task	Specification	Specification Description
10 51 13 00	01 11 19 00	No Specification Required



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SECTION 10 51 26 00 - PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad wood lockers.
2. Locker benches.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad wood lockers.
2. Locker benches.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker[**and bench**].

C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
4. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
5. Chain-of-Custody Qualification Data: For manufacturer and vendor.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
8. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
9. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
10. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
11. Product Data: For adhesives, indicating VOC content.
12. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

D. Shop Drawings: For plastic-laminate-clad wood lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in lockers.
5. Show locker fillers, trim, base, sloping tops, and accessories.
6. Show locker identification system and numbering sequence.

E. Samples for Initial Selection: For each type of the following:

1. High-pressure decorative laminates.
2. Thermally fused laminate overlay panels.
3. Carpet.

F. Samples for Verification: For the following products:

1. Plastic-laminate-clad panels, not less than **8 by 10 inches (200 by 250 mm)**, for each type, color, pattern, and surface finish[, **with separate samples of unfaced panel product used for core**].
2. Thermally fused laminate-overlay-surfaced panels, not less than **8 by 10 inches (200 by 250 mm)**, for each type, color, pattern, and surface finish.
3. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end pieces, not less than **18 inches wide by 18 inches high by 6 inches deep (457 mm wide by 450 mm high by 152 mm deep)**.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.
5. Carpet, not less than **8 by 10 inches (200 by 250 mm)**, for each type, color, and pattern.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Locker doors, complete with specified door hardware. Furnish no fewer than **[five]<Insert number>** doors of each type and color installed.
 2. Units of the following locker hardware items equal to **[10]<Insert number>** percent of amount installed for each type and finish installed, but no fewer than **[five]<Insert number>** units:
 - a. Hinges.
 - b. Pulls.
 - c. Shelf rests.
 - d. Cylinder[**and drawer**] locks.

- e. Blank identification plates[**and holders**].
- f. Hooks.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical corner[, **including one locker on each side of corner and corner filler**][, **including door panel with specified door hardware**]<Insert Project-specific requirements>, as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until painting and similar operations that could damage lockers have been completed in installation areas. If lockers must be stored in other-than-installation areas, store only in areas where environmental conditions are the same as those in final installation location, and comply with requirements specified in "Field Conditions" Article.
- B. Deliver [**master and control keys**][**combination control charts**] to Owner by registered mail or overnight package service[.][, **addressed as follows:**]
 - 1. <Insert name and address of Owner's representative>.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between **60 and 90 deg F (16 and 32 deg C)** and relative humidity between [**25 and 55**][**43 and 70**][**20 and 50**]<Insert number range> percent during the remainder of the construction period.
- B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
 - 1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.



- C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of concealed wood support bases.
 - 1. Requirements are specified in Section 061000 "Rough Carpentry."
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.
- C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to fabricator of lockers; coordinate Shop Drawings and fabrication with hardware requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of locks or hardware.
 - c. Deterioration of wood, finishes, and other materials beyond normal use.
 - d. **<Insert failure modes>**.
 - 2. Warranty Period: **[Three]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers **[and locker benches]** indicated to be accessible, comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and]****[ICC A117.1]****<Insert requirement>**.

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Classic Woodworking, LLC]**
 - 2. **[Club Resource Group]**
 - 3. **[Famous Lockers]**
 - 4. **[Hollman, Inc]**

5. [Ideal Products, Inc]
 6. [Legacy Lockers]
 7. [List Industries Inc.]
 8. [Treeforms]
 9. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Classic Woodworking, LLC]
 2. [Club Resource Group]
 3. [Famous Lockers]
 4. [Hollman, Inc]
 5. [Ideal Products, Inc]
 6. [Legacy Lockers]
 7. [List Industries Inc.]
 8. [Treeforms]
 9. <Insert manufacturer's name>
- C. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- D. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site.
- E. Regional Materials: Wood products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- F. Indigenous Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- I. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- J. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- K. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- L. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF

Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

- M. Construction Style: **[Manufacturer's standard][Flush overlay][Reveal overlay][Flush inset][Flush inset with face frame][As indicated]**.
 - 1. Reveal Dimension: **[1/2 inch (13 mm)][As indicated]<Insert dimension>**.
- N. Final Assembly: Manufacturer's standard **[factory][or][knocked-down]** assembly.
- O. Locker Body: Fabricated from **[particleboard][fire-retardant-particleboard]**-core panels covered on both sides with thermally fused laminate overlay.
 - 1. Side Panels: **[3/4 inch (19 mm)][5/8 inch (16 mm)][Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm)]** thick.
 - 2. Back Panel: **[1/2 inch (13 mm)][3/8 inch (9.5 mm)][Manufacturer's standard 1/2 or 3/8 inch (13 or 9.5 mm)]** thick.
 - 3. Top Panel: **[3/4 inch (19 mm)][5/8 inch (16 mm)][Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm)]** thick.
 - 4. Bottom Panel: **[3/4 inch (19 mm)][5/8 inch (16 mm)][Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm)]** thick.
 - 5. Exposed Panel Edges: **[Thermally fused laminate overlay to match panel][1-mm-thick PVC][3-mm-thick PVC][Vinyl T-molding][High-pressure decorative laminate, Grade HGS, to match panels][High-pressure decorative laminate, Grade VGS, to match panels]**.
- P. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade VGS, over both sides of **[particleboard][fire-retardant-particleboard][medium-density-fiberboard][fire-retardant-fiberboard]** core.
 - 1. Thickness: **[3/4 inch (19 mm)][5/8 inch (16 mm)][Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm)]** thick.
 - 2. Panel Edges: **[1-mm-thick PVC][3-mm-thick PVC][Vinyl T-molding][High-pressure decorative laminate, Grade VGS, to match panels][1/4-inch- (6-mm-) thick, solid wood][High-pressure decorative laminate, Grade HGP, postformed with 3/8-inch (9.5-mm) radius]**.
- Q. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.
- R. Shelves: Fabricated from **[particleboard][fire-retardant-particleboard]**-core panels covered on both sides with thermally fused laminate overlay; **[fixed][fixed unless otherwise indicated][adjustable][fixed and adjustable, as indicated]**.
 - 1. Thickness: **[3/4 inch (19 mm)][5/8 inch (16 mm)]**.
 - 2. Exposed Edges: **[Thermally fused laminate overlay to match panels][1-mm-thick PVC][3-mm-thick PVC][High-pressure decorative laminate, Grade VGS, to match panels]**.
- S. Drawer Faces: Match style, material, construction, and finish of plastic-laminate-clad wood doors. Attach drawer faces to subfronts with mounting screws from drawer interior.
- T. Drawer Subfronts, Sides, and Backs: Fabricated from **[particleboard][fire-retardant-particleboard]**-core panels covered on both sides with thermally fused laminate overlay.
 - 1. Thickness: **[1/2 inch (13 mm)][3/8 inch (9.5 mm)]**.
 - 2. Exposed Edges: **[Thermally fused laminate overlay to match panel][1-mm-thick PVC][3-mm-thick PVC][High-pressure decorative laminate, Grade VGS, to match panels][1/4-inch- (6-mm-) thick, solid wood]**.

- U. Drawer Bottoms: **1/4-inch- (6-mm-)** thick, thermally fused laminate overlay over particleboard core.
- V. Corners and Filler Panels: **3/4-inch- (19-mm-)** thick panels. Match style, material, construction, and finish of plastic-laminate-clad wood doors.
- W. Continuous Finish Base: Plastic-laminate-clad, **3/4-inch- (19-mm-)** thick panel that matches door faces; fabricated in lengths as long as practical to enclose base and base ends of lockers.
- X. Continuously Sloping Tops: Plastic-laminate-clad, **3/4-inch- (19-mm-)** thick panel that matches door faces for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practical, without visible fasteners at splice locations. Provide fasteners, supports, and closures, as follows:
 - 1. Closures: **[Vertical][Hipped]**-end type.
 - 2. Sloping-top corner fillers, mitered.
- Y. Plastic-Laminate Colors, Patterns, and Finishes:
 - 1. As indicated by manufacturer's designations.
 - 2. Match Architect's samples.
 - 3. As selected by Architect from plastic-laminate manufacturer's full range of **[solid colors][solid colors with core same color as surface][wood grains][patterns]**.
 - 4. **<Insert color, pattern, and finish>**.

2.3 MATERIALS

- A. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
 - 2. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 3. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 - 5. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 - 6. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 7. Thermally Fused Laminate (TFL) Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper.
 - 8. Medium-Density Fiberboard: ANSI A208.2, **[Grade 130]<Insert grade>**.
 - 9. Particleboard: ANSI A208.1, **[Grade M-2][Grade M-2-Exterior Glue]**.
 - 10. Softwood Plywood: DOC PS 1[, **medium-density overlay**].
- B. High-Pressure Decorative Laminate: ISO 4586-3, grades as follows:

1. Horizontal Surfaces: Grade HGS.
 2. Postformed Surfaces: Grade HGP.
 3. Vertical Surfaces: [**Grade HGS**][**Grade VGS**].
- C. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
1. Do not use material that is warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
 3. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E84:
 - a. Panels 3/4 Inch (19 mm) Thick and Less: ANSI A208.1, Grade M-2, except for the following minimum properties: density, **45 lb/cu. ft. (720 kg/cu. m)**; modulus of rupture, **1600 psi (11 MPa)**; modulus of elasticity, **300,000 psi (2000 MPa)**; internal bond, **80 psi (550 kPa)**; and screw-holding capacity on face and edge, **250 and 225 lbf (1100 and 1000 N)**, respectively.
 - b. Panels 13/16 to 1-1/4 Inches (20 to 32 mm) Thick: ANSI A208.1, Grade M-1, except for the following minimum properties: density, **44 lb/cu. ft. (705 kg/cu. m)**; modulus of rupture, **1300 psi (9 MPa)**; modulus of elasticity, **250,000 psi (1700 MPa)**; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, **250 and 175 lbf (1100 and 780 N)**, respectively.
 4. Fire-Retardant Fiberboard: Medium-density panels according to ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less according to ASTM E84.
- D. Adhesives: Do not use adhesives that contain urea formaldehyde.
- E. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.
- H. Adhesives: Do not use adhesives that contain urea formaldehyde.
- I. Furring, Blocking, Shims, and Hanging Strips: [**Softwood or hardwood lumber**][**Fire-retardant-treated softwood lumber**], kiln dried to less than 15 percent moisture content.
- J. Anchors: Material, type, size, and finish as required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- K. Wood Support Base: [**2-by-4-inch nominal-size (51-by-102-mm, actual-size)**][**2-by-6-inch, nominal-size (51-by-152-mm, actual-size)**] lumber treated with manufacturer's standard preservative-treatment,

[nonpressure][pressure] process.

2.4 HARDWARE

- A. Cam Padlock Hasp: Surface mounted, steel; finished to match other locker hardware.
- B. Cylinder Lock: Built-in, flush cam locks with five-pin tumbler keyway, keyed separately and master keyed. Furnish two change keys for each lock and [two]<Insert number> master keys.
 - 1. Key Type: [Flat][Grooved], with minimum 2-by-2.68-inch (51-by-68.3-mm) key head for accessible lockers].
 - 2. Bolt Operation: [Manually locking deadbolt][or][automatically locking spring bolt].
- C. Built-in Combination Lock: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key. [Provide brass-finish escutcheon plate.]
 - 1. Bolt Operation: [Manually locking deadbolt][or][automatically locking spring bolt].
- D. Built-in, Coin-Operated Lock: Self-contained units mounted to door interior with replaceable lock cylinders keyed separately and master keyed. Mount instruction decals to both door faces. Furnish one change key for each lock and one master key.
 - 1. Bolt Operation: [Manually locking deadbolt][or][automatically locking spring bolt].
 - 2. Lock Type: Fee [return/deposit][collect/pay].
 - 3. Fee Type: [Token][Coin, one quarter][Coin, two quarters].
 - 4. Coin Box: Mount collection box to lock unit, key collection boxes alike. Furnish with removable cylinder and key.
- E. Built-in, Card-Operated Lock: Self-contained units mounted to door interior with replaceable lock cylinders, keyed separately and master keyed. Mount instruction decals to both door faces. Furnish one change card key for each lock and one master card key.
 - 1. Bolt Operation: [Manually locking deadbolt][or][automatically locking spring bolt].
- F. Digital Keypad Lock: Battery-powered electronic keypad with reprogrammable manager and owner codes that override access. Three consecutive incorrect code entries will disable lock for three minutes.
 - 1. Designed for permanently assigned access via entry of user's four-digit code.
 - 2. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock. Provide LED indicator to show when lock is in use.
- G. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges; back mounted.
 - 1. Provide two hinges for doors [36 inches (910 mm)][42 inches (1067 mm)] high and less.
 - 2. Provide three hinges for doors more than [36 inches (910 mm)][42 inches (1070 mm)] high.
- H. Semiconcealed Hinges: Single-pivot, spring-loaded steel hinges; back mounted.
 - 1. Provide two hinges for doors [36 inches (910 mm)][42 inches (1070 mm)] high and less.
 - 2. Provide three hinges for doors more than [36 inches (910 mm)][42 inches (1070 mm)] high.
- I. Frameless Hinges (European Type): Fully concealed[, self-closing], nickel-plated steel, with not less than 125 degrees of opening.

1. Provide two hinges for doors [36 inches (910 mm)][42 inches (1070 mm)] high and less.
 2. Provide three hinges for doors more than [36 inches (910 mm)][42 inches (1070 mm)] high.
- J. Wire Pulls: Back mounted; [4 inches (102 mm) long, 5/16 inch (8 mm) in diameter][5 inches (127 mm) long, 2-1/2 inches (62 mm) deep, and 5/16 inch (8 mm) in diameter].
- K. Knobs: Metal; back mounted; [1-inch- (25-mm-)][1-1/2-inch- (38-mm-)] diameter, [flat round][ball] shape.
- L. Accessible Handle: Metal, fixed, graspable lever handle and rose trim; surface mounted.
- M. Shelf Rests: BHMA A156.9, B04013.
- N. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, and rated for a load of [75 lbf (330 N)][100 lbf (440 N)].
- O. Drawer Locks: Cam padlock hasp or cylinder lock; surface mounted on inside of drawer.
- P. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; [brass finished][chrome finished][epoxy coated][finished to match other locker hardware]. Attach hooks with at least two fasteners.
1. Provide hooks as indicated on Drawings.
 2. Provide [one double-prong ceiling hook][and][two single-prong wall hooks] for each compartment of [single-tier][double-tier][triple-tier][and][open-front] lockers.
 3. Provide [one double-prong ceiling hook][and][two single-prong wall hooks] for each bottom compartment of top-modified lockers.
 4. Provide [one double-prong ceiling hook][and][two single-prong wall hooks] for each top compartment of bottom-modified lockers.
 5. Provide one double-prong ceiling hook for each compartment of interlocking lockers.
- Q. Coat Rods: [1-inch- (25-mm-)][3/4-inch- (19-mm-)] diameter steel; [brass finished][chrome finished][nickel plated][finished to match other locker hardware].
1. Provide coat rods as indicated on Drawings.
 2. Provide coat rod for each compartment of [single-tier][double-tier][triple-tier][bottom compartment of top-modified][top compartment of bottom-modified][interlocking][and][open-front] lockers.
 3. Provide coat rod in lieu of ceiling hook for lockers 24 inches (610 mm) high or taller.
- R. Exposed Hardware Finish:
1. [Polished chrome][Polished brass][Satin chrome][Satin brass] unless otherwise indicated.
 2. Unless otherwise indicated, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - a. Bright Brass, Clear Coated: BHMA 632 for steel base; BHMA 605 for brass base.
 - b. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - c. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
 - d. <Insert finish>.

2.5 ACCESSORIES

- A. Door Trays: Fabricated from solid wood.
 - 1. Provide **[matching wood towel rod][brass-finished steel towel rod][chrome-finished steel towel rod][nickel-plated steel towel rod][towel rod finished to match other locker hardware]**; attached to bottom of door tray.
- B. Mirrors: ASTM C1036, Type I, Class 1, Quality q2; with second (back) surface coated with successive layers of chemically deposited silver, copper, and protective organic coating to produce coating system according to performance requirements in ASTM C1503 for mirror-quality glazing.
 - 1. Glass Thickness: **[3 mm][5 mm]** minimum unless otherwise indicated.
 - 2. Frame: Solid wood.
- C. Security Lock Boxes: **[6 inches wide by 6 inches high (152 mm wide by 152 mm high)]<Insert dimensions>** by depth of locker; with piano hinge and **[cylinder][built-in combination]** lock.
- D. Security Vaults: **[6 inches wide by 4 inches high by 6 inches deep (152 mm wide by 102 mm high by 152 mm deep)]<Insert dimensions>**; fabricated from steel sheet; with built-in combination lock.
- E. Protective Mats: **1/8-inch- (3-mm-)** thick, solid rubber.
- F. Number Identification Plates: **1-1/2-inch- (38-mm-)** diameter, etched, embossed, or stamped, **[brass][aluminum][stainless steel][plastic]** plates with black numbers and letters at least **1/2 inch (13 mm)** high. Identify lockers in sequence indicated on Drawings. **[Finish plates to match other locker hardware.]**
- G. Name Identification Plates and Plate Holders: **[1-inch-high by 4-inch-wide (25-mm-high by 102-mm-wide)]<Insert dimensions>**, etched, embossed, or stamped, **[brass][aluminum][stainless steel][plastic]** plates with black letters at least **1/2 inch (13 mm)** high. Identify lockers as indicated on Drawings. **[Finish nameplates and holders to match other locker hardware.]**

2.6 LOCKER BENCHES

- A. End-Panel Locker Benches: Bench top supported between vertical end supports, as follows:
 - 1. End Supports: **[4-inch (102-mm)][3-inch (76-mm)]<Insert dimension>** thickness, with height and width **[1 inch (25 mm) more than][2 inches (51 mm) more than][same as]** height and width of bench.
 - a. Finish: Match style, material, construction, and finish of plastic-laminate-clad locker doors.
 - 2. Bench Top: **3-inch- (76-mm-)** thick, particleboard core. Provide **1/2-inch- (13-mm-)** radius top edges on bench sides.
 - a. Width: **[15 inches (381 mm)][17 inches (432 mm)]<Insert dimension>** **[except provide minimum 20-inch (508-mm) width where accessible benches are indicated].**
 - b. Height: **[18 inches (457 mm)]<Insert dimension>** measured from top of bench to floor.
 - c. Length: **[36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)][72 inches (1829 mm)].**
 - d. Finish: Bond the following material to core:
 - 1) High-Pressure Decorative Laminate: **[As indicated by manufacturer's**

- designations][Match Architect's sample][As selected by Architect from manufacturer's full range].**
- 2) Carpet: **[As indicated by manufacturer's designations.][As selected by Architect from manufacturer's full range.][As specified in Section 096816 "Sheet Carpeting."]<Insert manufacturer's name; product name or designation>.**
- B. Waterfall-Design Locker Benches: Integral bench top and end supports. **3-inch- (76-mm-)** thick, particleboard core. Radius top edge of supports flush with top of bench.
1. Width: **[15 inches (381 mm)][17 inches (432 mm)]<Insert dimension>[except provide minimum 20-inch (508-mm) width where accessible benches are indicated].**
 2. Height: **[18 inches (457 mm)]<Insert dimension>** measured from top of bench to floor.
 3. Length: **[36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)][72 inches (1829 mm)].**
 4. Outside Frames: **1-by-3-inch- (25-by-76-mm-)** wide, solid wood extending continuously along faces of end supports and bench top. Match radius at transition between end supports and bench top.
 5. Finish: Bond the following material to core:
 - a. High-Pressure Decorative Laminate: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].**
 - b. Carpet: **[As indicated by manufacturer's designations.][As selected by Architect from manufacturer's full range.][As specified in Section 096816 "Sheet Carpeting."]<Insert manufacturer's name; product name or designation>.**
- C. Pedestal-Leg Locker Benches: Bench top supported by pedestal legs, minimum of two pedestals for each bench, with overall height of **[18 inches (457 mm)]<Insert dimension>** measured from top of bench to floor, as follows:
1. Wood Pedestal Legs: Solid wood, in inverted-T shape. Match finish of locker doors.
 2. Metal Pedestal Legs: **1-1/2-inch- (38-mm-)** **[diameter, stainless steel round tube or pipe][square, stainless steel tube][square, brass tube][diameter, solid aluminum][square, painted steel tube].**
 3. Bench Tops: **1-1/4 inches (32 mm)** deep; fabricated as follows:
 - a. Butcher Block Top: Solid laminated hardwood.
 - b. High-Pressure Decorative Laminate Top: Post formed over particleboard core, with color **[as indicated by manufacturer's designations][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color, pattern, and finish><Insert manufacturer's name; product name or designation>.**
 - c. Width: **[15 inches (381 mm)][17 inches (432 mm)]<Insert dimension>[except provide minimum 20-inch (508-mm) width where accessible benches are indicated].**
 - d. Length: **[36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)][72 inches (1829 mm)].**
 4. Bench Backs: Back support for full width of bench, secured to bench.
 - a. Construction: Match style, material, and finish of bench top:
 - b. Height: Beginning at a point no more than **2 inches (51 mm)** above the seat surface to a height no less than **18 inches (457 mm)** above the seat surface.

2.7 FABRICATION

- A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.
 - 1. Fabricate lockers to dimensions, profiles, and details indicated.
 - 2. Ease edges of corners of solid-wood members to **1/16-inch (1.5-mm)** radius.
- B. Fabricate lockers square, rigid, without warp, and with finished faces flat and free of dents, scratches, and chips. Accurately factory machine components for attachments. Make joints tight and true.
 - 1. Fabricate lockers using manufacturer's standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.
 - 2. Fabricate lockers with joints that are dadoed or rabbeted, glued full length, and stapled. Dado side panels to receive shelving except where indicated to be adjustable.
 - 3. Join drawer subfronts, backs, and sides with manufacturer's standard glued joints.
 - 4. Join drawer subfronts, backs, and sides with **[glued rabbeted joints supplemented by mechanical fasteners][or][glued dovetail joints]**.
- C. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than **15 inches (381 mm)** above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than **48 inches (1219 mm)** above the floor.
- D. Venting: Fabricate lockers with space between doors and locker assembly of not less than **[1/4 inch (6 mm)][3/4 inch (19 mm), with painted metal security screen attached to each shelf between doors]<Insert dimension>**.
- E. Number Identification Plates: Inlay number plates flush in each locker door, near top, centered.
- F. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that the parts fit as intended, and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
 - 2. Use only manufacturer's nuts, bolts, screws, and other devices for assembly.
- G. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- H. Attach PVC edging to panels by thermally fusing edging to panels after panel fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for

installation tolerances and other conditions affecting performance of the Work.

- B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Condition lockers to average prevailing humidity conditions in installation areas before installation.
- B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

- A. Install wood support base[**with 1/2-inch- (13-mm-) thick, plywood top**].
- B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- C. Install lockers level, plumb, and true; use concealed shims.
- D. Connect groups of lockers together with manufacturer's standard[**brass-finished**] fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.
- E. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Installation Tolerance: No more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line. Shim as required with concealed shims.
- F. Locker Anchorage:
 - 1. Fasten lockers through wood locker base, at ends, and not more than **36 inches (910 mm)** o.c. with [No. 8 flush-head][No. 8 brass-finished, flush-head]<Insert requirement> wood screws sized for **1-inch (25-mm)** penetration into wood base.
 - 2. Fasten lockers through back, near top and bottom, at ends with [No. 8 flush-head wood screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or furring][No. 8 brass-finished, flush-head wood screws sized for 1-inch (25-mm) penetration into wood base wood framing, blocking, or furring][No. 8 pan- or bugle-head wood screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or furring][No. 8 pan-head sheet metal screws through metal backing or metal framing behind wall finish] and spaced not more than **16 inches (400 mm)** o.c.
- G. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.
- H. Attach sloping-top units to lockers, with end panels covering exposed ends.
- I. Install [number identification plates][and][name identification plates and holders] after lockers are

in place.

1. Attach number identification plate on each locker door, near top, centered, with at least two screws with finish matching the plate.
2. Attach name identification plate holder on each locker door, centered[**below number plate**], with at least two screws, with finish matching the name identification plate holder.
3. Insert name identification plate into matching nameplate holder on each door.

J. Provide protective mat at each shoe shelf.

K. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than **72 inches (1830 mm)** apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

L. Movable Locker Benches: Place benches in locations indicated on Drawings.

3.4 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors[**and drawers**] to operate easily without binding.[**Verify that integral locking devices operate properly.**]

3.5 PROTECTION

- A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 26 00



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Task	Specification	Specification Description
10 51 53 00	01 11 19 00	No Specification Required



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SECTION 10 55 00 00 - USPS-DELIVERY POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mail receptacles.
2. Cluster box units.
3. Parcel lockers.
4. Front-loading collection boxes.
5. Rear-loading collection boxes.
6. Accessories.

B. Related Requirements:

1. **[Section 087100 "Door Hardware"]**[**Section 087111 "Door Hardware (Descriptive Specification)"**] for lock cylinders for postal specialties that are keyed to building keying system and for letter slots in doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.

B. Shop Drawings: For postal specialties.

1. Include plans, elevations, sections, and attachment details.
2. Include identification sequence for compartments.
3. Include layout of identification text.
4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.

C. Samples for Verification: For each type of exposed finish, prepared on **6-by-6-inch (150-by-150-mm)** square Samples.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.



1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Key Blanks: **[50]<Insert number>** for every **<Insert number>** locks or fraction thereof, for each type of compartment-door lock installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Furnish lock keys according to USPS requirements; with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAIL RECEPTACLES

- A. Front-Loading Mail Receptacles : Consisting of multiple compartments with fixed, solid compartment backs, enclosed within a recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-STD-4C.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**

3. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; prepared to receive master-door lock.
 - a. Master-Door Lock: Door prepared to receive lock provided by local postmaster.

4. Compartments: **[Number and size as follows:]****[As indicated on Drawings, of the following sizes:]****[As indicated on Drawings.]**
 - a. Type I: A group of mail receptacles in single-column configuration with single master door, **[three]<Insert number up to eight>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, one outgoing mail collection compartment prepared for master-door lock, and one parcel-locker compartment **15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)**.
 - b. Type II: A group of mail receptacles in double-column configuration with double master door, **[three]<Insert number up to 16>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, one outgoing mail collection compartment prepared for master-door lock, and **[one][two]** parcel-locker compartment(s): **[15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][and][18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)]**.
 - c. Type III: A group of mail receptacles in double-column configuration with single master door, **[three]<Insert number up to 16>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, one outgoing mail collection compartment prepared for master-door lock, and **[one][two]** parcel-locker compartment(s): **[15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][and][18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)]**.
 - d. Type VI (No Parcel-Locker Compartment): A group of mail receptacles in single-column configuration with single master door, **[three]<Insert number up to nine>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, and one outgoing mail collection compartment prepared for master-door lock.
 - e. Type VIII (No Parcel-Locker Compartment): A group of mail receptacles in double-column configuration with double master door, **[three]<Insert number up to 19>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, and one outgoing mail collection compartment prepared for master-door lock.

5. Compartment Doors: Fabricated from extruded aluminum. Equip each with lock and tenant identification as required by USPS-STD-4C. **[Provide mail slot in the compartment with master-door lock.]**



- a. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.
 - b. Parcel-Locker-Compartment-Door Locks: Two-key security system in which control key provides access to parcel-locker-compartment key, which opens compartment and is retained once opened.
 6. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder and blank cards for tenant's identification within each compartment.
 7. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
 8. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: **[Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.
- B. Rear-Loading Mail Receptacles : Consisting of multiple compartments enclosed within a recessed wall box. Provide access to compartments for distributing incoming mail from rear of unit with accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-STD-4C.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**
 3. Compartments: **[Number and size as follows:][As indicated on Drawings, of the following sizes:][As indicated on Drawings.]**
 - a. Type IV: A group of mail receptacles in single-column configuration with a rear-access

- cover, **[three]<Insert number up to eight>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, one outgoing mail collection compartment, and one parcel-locker compartment **15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)**.
- b. Type V: A group of mail receptacles in double-column configuration with a rear-access cover, **[three]<Insert number up to 16>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, one outgoing mail collection compartment, and **[one][two]** parcel-locker compartment(s) **[15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][and][18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)]**.
 - c. Type VII (No Parcel-Locker Compartment): A group of mail receptacles in single-column configuration with a rear-access cover, **[three]<Insert number up to nine>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, and one outgoing mail collection compartment.
 - d. Type IX (No Parcel-Locker Compartment): A group of mail receptacles in double-column configuration with a rear-access cover, **[three]<Insert number up to 19>** mail compartments not less than **3 inches high by 12 inches wide by 15 inches deep (76 mm high by 305 mm wide by 381 mm deep)**, and one outgoing mail collection compartment.
4. Rear-Loading Cover: **[Not required][Lift-off rear cover fabricated from extruded aluminum or aluminum sheet, finished to match front of unit]**.
 5. Rear-Loading Door: Side hinged, fabricated from extruded aluminum or aluminum sheet, finished to match front of unit; with full-length, stainless-steel piano hinge on one side and **[positive-latching][locking]** mechanism on the other.
 - a. Rear-Door Lock: Door prepared to receive lock provided by local postmaster.
 6. Compartment Doors: Fabricated from extruded aluminum. Equip each with lock and tenant identification as required by USPS-STD-4C. **[One compartment with outgoing mail slot.]**
 - a. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.
 - b. Parcel-Locker-Compartment-Door Locks: Two-key security system in which control key provides access to parcel-locker-compartment key, which opens compartment and is retained once opened.
 7. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder and blank cards for tenant's identification behind each compartment.
 8. Snap-on Trim: Fabricated from same material and finish as compartment doors.
 9. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
 10. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: **[Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.

2.2 CLUSTER BOX UNITS (CBUs)

- A. Cluster Box Units (CBUs): Consisting of multiple compartments enclosed within a freestanding,



pedestal-mounted enclosure. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging pair of side-hinged master doors to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-B-1118G.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jensen Mailboxes Manufacturing Company]**
 - d. **[National Mailboxes; a division of NMHP, Inc.]**
 - e. **[Postal Products Unlimited, Inc.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jensen Mailboxes Manufacturing Company]**
 - d. **[National Mailboxes; a division of NMHP, Inc.]**
 - e. **[Postal Products Unlimited, Inc.]**
 - f. **<Insert manufacturer's name>**

B. Compartment Enclosure: Fabricated from aluminum sheet with aluminum mounting pedestal and weather-protection hood, with the following number and size of compartments:

1. Type I: Eight compartments 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), one outgoing mail compartment 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), one parcel-locker compartment 12 inches wide by 10 inches high by 15 inches deep (305 mm wide by 254 mm high by 381 mm deep), and another parcel-locker compartment 12 inches wide by 13-1/2 inches high by 15 inches deep (305 mm wide by 343 mm high by 381 mm deep).
2. Type II: 12 compartments 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), one outgoing mail compartment 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), and one parcel-locker compartment 12 inches wide by 10 inches high by 15 inches deep (305 mm wide by 254 mm high by 381 mm deep).
3. Type III: 16 compartments 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), one outgoing mail compartment 12 inches wide by 3 inches high by 15 inches deep (305 mm wide by 76 mm high by 381 mm deep), one parcel-locker compartment 12 inches wide by 10 inches high by 15 inches deep (305 mm wide by 254 mm high by 381 mm deep), and another parcel-locker compartment 12 inches wide by 13-1/2 inches high by 15 inches deep (305 mm wide by 343 mm high by 381 mm deep).
4. Type IV: 13 compartments 12 inches wide by 4-3/4 inches high by 15 inches deep (305 mm wide by 121 mm high by 381 mm deep), one outgoing mail compartment 12 inches wide by 4-3/4 inches high by 15 inches deep (305 mm wide by 121 mm high by 381 mm deep), and one parcel-locker compartment 12 inches wide by 10 inches high by 15 inches deep (305 mm wide by 254 mm high by 381 mm deep).

C. Compartment Doors and Frames: Fabricated from one-piece extruded aluminum or aluminum sheet.

Equip each compartment door with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide outgoing mail slot with weather protection flap.

1. Tenant Identification: Number **[engraved into face][applied into recess]** of compartment door.
 2. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.
 3. Parcel-Locker-Compartment-Door Locks: Two-key security system in which control key provides access to parcel-locker-compartment key, which opens compartment and is retained once opened.
- D. Pedestal: Aluminum, with same finish as compartment enclosure and attached with theft-resistant fasteners.
- E. Exposed Aluminum Finish: Finish surfaces exposed to view with powder-coated finish in **[postal gray (light gray)][color as selected by Architect from manufacturer's full range of colors]<Insert color>**.

2.3 PARCEL LOCKERS

- A. Front-Loading Parcel Lockers, Recessed : Consisting of single or multiple compartments enclosed within a larger enclosure of type indicated below. Provide access to compartments for distributing incoming parcels from front of unit. Provide access to each compartment for removing parcels by swinging compartment door. Comply with USPS-STD-4C.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jayco Industries]**
 - d. **[Jensen Mailboxes Manufacturing Company]**
 - e. **[National Mailboxes; a division of NMHP, Inc.]**
 - f. **[Postal Products Unlimited, Inc.]**
 - g. **[W. A. Charnstrom Company]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jayco Industries]**
 - d. **[Jensen Mailboxes Manufacturing Company]**
 - e. **[National Mailboxes; a division of NMHP, Inc.]**
 - f. **[Postal Products Unlimited, Inc.]**
 - g. **[W. A. Charnstrom Company]**
 - h. **<Insert manufacturer's name>**
 3. Enclosure Type: Recessed.
 4. Compartments: **[Number and size as follows:][As indicated on Drawings, of the following sizes:][As indicated on Drawings.]**



- a. Type X, Parcel Only, Single: Single parcel receptacle [15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)] without a master door.
 - b. Type X, Parcel Only, Group: A group of parcel receptacles in single-column configuration without a master door; [one][two] compartment(s) 18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)[and][one] compartment 15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)].
 - c. Type XI, Parcel Only, Group: A group of parcel receptacles in single-column configuration with single master door prepared for master-door lock; [one][two][compartment(s) 15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][and][one][two][compartment(s) 18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)].
5. Front-Loading Master Door: Fabricated to hold compartment doors; prepared to receive master-door lock provided by local postmaster.
 6. Compartment Doors and Frames: Fabricated from [same material and finish as adjacent mail receptacles][extruded aluminum][aluminum sheet][metallic-coated steel sheet][aluminum or metallic-coated steel sheet]. Equip each compartment door with lock; identification; and concealed, full-length, spring-loaded, flush hinge on right side.
 - a. Compartment Identification: Black, sequential numbers [engraved into][stamped onto] recess in face of compartment door.
 - b. Compartment-Door Locks: Dual-lock security system in which master lock provides access to customer lock (USPS-L-1172C) and parcel-locker key opens compartment and is retained once opened.
 7. Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: [Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>.
- B. Rear-Loading Parcel Lockers, Recessed : Consisting of single or multiple compartments enclosed within a recessed wall box. Provide access to compartments for distributing incoming parcels from rear of unit with accessibility to entire group of compartments. Provide access to each compartment for removing parcels by swinging compartment door. Comply with USPS-STD-4C.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Eagle Mailbox Mfg. Corp.]
 - b. [Florence Corporation; Gibraltar Industries Company]
 - c. [Jayco Industries]
 - d. [Jensen Mailboxes Manufacturing Company]
 - e. [Postal Products Unlimited, Inc.]
 - f. [W. A. Charnstrom Company]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jayco Industries]**
 - d. **[Jensen Mailboxes Manufacturing Company]**
 - e. **[Postal Products Unlimited, Inc.]**
 - f. **[W. A. Charnstrom Company]**
 - g. **<Insert manufacturer's name>**
3. Compartments: **[Number and size as follows:]****[As indicated on Drawings, of the following sizes:]****[As indicated on Drawings.]**
- a. Type XII, Parcel Only: A group of parcel receptacles in single-column configuration with a rear-access cover; **[one][two][compartment(s) 15 inches high by 12 inches wide by 15 inches deep (381 mm high by 305 mm wide by 381 mm deep)][and][one][two][compartment(s) 18 inches high by 12 inches wide by 15 inches deep (457 mm high by 305 mm wide by 381 mm deep)].**
4. Rear-Loading Cover: **[Not required]****[Lift-off rear cover fabricated from extruded aluminum or aluminum sheet, finished to match front of unit].**
5. Rear-Loading Door: Side hinged, fabricated from extruded aluminum or aluminum sheet, finished to match front of unit; with full-length, stainless-steel piano hinge on one side and **[positive-latching][locking]** mechanism on the other.
- a. Rear-Door Lock: Door prepared to receive lock provided by local postmaster.
6. Compartment Doors and Frames: Fabricated from **[same material and finish as adjacent mail receptacles][extruded aluminum][aluminum sheet][metallic-coated steel sheet][aluminum or metallic-coated steel sheet]**. Equip each compartment door with lock; identification; and concealed, full-length, spring-loaded, flush hinge on one side.
- a. Compartment Identification: Black, sequential numbers **[engraved into][stamped onto]** recess in face of compartment door.
 - b. Compartment-Door Locks: Dual-lock security system in which master lock provides access to customer lock (USPS-L-1172C) and parcel-locker key opens compartment and is retained once opened.
7. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
- a. Baked-Enamel or Powder-Coated Finish: **[Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.
- C. Outdoor Parcel Lockers, Pedestal Mounted : Consisting of multiple compartments enclosed within a freestanding, pedestal-mounted enclosure. Provide access to compartments for distributing incoming parcels from front of unit by unlocking master lock and swinging pair of side-hinged master doors to provide accessibility to entire group of compartments. Provide access to each compartment for removing parcels by swinging compartment door.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**



- d. [Jayco Industries]
 - e. [Jensen Mailboxes Manufacturing Company]
 - f. [National Mailboxes; a division of NMHP, Inc.]
 - g. [Postal Products Unlimited, Inc.]
 - h. [Security Manufacturing Corporation]
 - i. [W. A. Charnstrom Company]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Eagle Mailbox Mfg. Corp.]
 - b. [Bommer Industries, Inc]
 - c. [Florence Corporation; Gibraltar Industries Company]
 - d. [Jayco Industries]
 - e. [Jensen Mailboxes Manufacturing Company]
 - f. [National Mailboxes; a division of NMHP, Inc.]
 - g. [Postal Products Unlimited, Inc.]
 - h. [Security Manufacturing Corporation]
 - i. [W. A. Charnstrom Company]
 - j. <Insert manufacturer's name>
 3. Compartment Enclosure: Fabricated from aluminum sheet with aluminum mounting pedestal and weather-protection hood, with the following number and size of compartments:
 - a. Type I: One box with two compartments, one on top of the other, each compartment with inside dimensions of **12 inches wide by 14 inches high by 15 inches deep (305 mm wide by 356 mm high by 381 mm deep)**.
 - b. Type II: One box with four compartments, side by side, two on top and two on bottom, each compartment with inside dimensions of **12 inches wide by 14 inches high by 15 inches deep (305 mm wide by 356 mm high by 381 mm deep)**.
 4. Compartment Doors and Frames: Fabricated from one-piece extruded aluminum or aluminum sheet. Equip each compartment door with lock, tenant identification; and concealed, full-length, flush hinge on one side. Provide outgoing mail slot with weather protection flap.
 - a. Locker Identification: Number **[engraved into face][applied into recess]** of compartment door.
 - b. Door Locks: Two-key security system in which control key provides access to parcel-locker key, which opens compartment and is retained once opened.
 5. Pedestal: Aluminum, with same finish as compartment enclosure and attached with theft-resistant fasteners.
 6. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: **[Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.

2.4 COLLECTION BOXES

- A. Front-Loading Collection Boxes : Consisting of single compartment with fire-resistant cushion bottom, enclosed within wall box, with **[mail slot][hopper door]** to receive mail. Provide door for collecting mail

from front of unit.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**
3. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
4. Height:
 - a. Sized to match height of **[four][five][six][seven]<Insert number>** mail receptacles.
 - b. **[As indicated on Drawings]<Insert dimension>**.
5. Compartment Doors and Frames: Fabricated from **1/4-inch- (6-mm-)** thick aluminum, with opening not less than **12 by 20 inches (305 by 508 mm)** and not more than **18 by 30 inches (457 by 762 mm)**. Equip door with lock and concealed, full-length, flush hinge on one side.
 - a. Door Lock: Door prepared to receive lock provided by local postmaster.
 - b. Identification: Engrave face of compartment door with **1-inch- (25-mm-)** high letters as follows: "U.S. MAIL LETTER BOX" on two lines at top or bottom of unit.
 - c. Door Style: **[Set door within face frame][Extend door full width and height of unit, with no exposed frame]**.
6. Mail Slot: Fabricated from **1/4-inch- (6-mm-)** thick aluminum, with **11-inch-wide by 1-1/4-inch- (279-mm-wide by 32-mm-)** high opening, protected by inside hood and hinge flap, and with inside baffle to prevent removal of mail from box.
7. Hopper Door: Fabricated from **1/4-inch- (6-mm-)** thick aluminum, with opening that allows a bundle measuring **6-1/2 inches wide by 11-1/2 inches long by 4 inches high (165 mm wide by 292 mm long by 102 mm high)** to be deposited, and with inside baffle to prevent removal of mail from box. Equip door with door pull and concealed, full-length bottom hinge.



- a. Identification: Engrave face of hopper door with **1-inch- (25-mm-)** high letters as follows: "LETTERS AND LETTER MAIL TIED IN BUNDLES."
 - b. Door Style: **[Set door within face frame][Extend door full width and height of unit, with no exposed frame].**
 8. Exposed Materials: Fabricated from extruded or sheet aluminum.
 - a. Anodic Finish: **[Clear][As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>.**
 - b. Baked-Enamel or Powder-Coated Finish: **[Silver][Black][Medium bronze][Dark bronze][Gold][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>.**
 9. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
 10. Schedule-Card Holder: Recessed or surface-mounted holder for pickup schedule card in center of bottom front portion of unit. Fabricate of same material and finish as front of unit.
 11. Mailbag Hooks: Two aluminum or stainless-steel hooks at exterior front edge of bottom of surface-mounted units, spaced **15 to 17-1/2 inches (381 to 445 mm)** apart, for supporting mailbags.
 12. Mailbag Rack: Internal rack system for supporting mailbags within unit.
- B. Rear-Loading Collection Boxes : Consisting of single compartment with fire-resistant cushion bottom, enclosed within a recessed wall box, with **[mail slot][hopper door]** to receive mail. Provide access to compartment for collecting mail from rear of unit.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**

- j. <Insert manufacturer's name>
3. Height:
 - a. Sized to match height of [four][five][six][seven] mail receptacles.
 - b. [As indicated on Drawings]<Insert dimension>.
4. Compartment Frame and Front Panel: Fabricated from 1/4-inch- (6-mm-) thick aluminum.
 - a. Identification: Engrave face of front panel with 1-inch- (25-mm-) high letters as follows:
"U.S. MAIL LETTER BOX" on two lines at top or bottom of unit.
5. Mail Slot: Fabricated from 1/4-inch- (6-mm-) thick metal plate, with 11-inch-wide by 1-1/4-inch- (279-mm-wide by 32-mm-) high opening, protected by inside hood and hinge flap, and with inside baffle to prevent removal of mail from box.
6. Hopper Door: Fabricated from 1/4-inch- (6-mm-) thick metal plate, with opening that allows a bundle measuring 6-1/2 inches wide by 11-1/2 inches long by 4 inches high (165 mm wide by 292 mm long by 102 mm high) to be deposited, and with inside baffle to prevent removal of mail from box. Equip door with door pull and concealed, full-length bottom hinge.
 - a. Identification: Engrave face of hopper door with 1-inch- (25-mm-) high letters as follows:
"LETTERS AND LETTER MAIL TIED IN BUNDLES."
 - b. Door Style: [Set door within face frame][Extend door full width and height of unit, with no exposed frame].
7. Rear-Loading Enclosure: Lift-off rear cover fabricated from same material and finish as front of unit.
8. Rear-Loading Door: Side hinged, with opening not less than 12 by 20 inches (305 by 508 mm) and not more than 18 by 30 inches (457 by 762 mm), fabricated from same material and finish as front of unit; with full-length, stainless-steel piano hinge on one side and positive-latching mechanism on the other. Fabricate rear-loading door to remain open while mail is collected.
 - a. Rear-Door Lock: Door prepared to receive lock provided by local postmaster.
9. Exposed Materials: Fabricated from extruded or sheet aluminum.
 - a. Anodic Finish: [Clear][As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>.
 - b. Baked-Enamel or Powder-Coated Finish: [Black][Gold][Dark bronze][Medium bronze][Silver][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>.
10. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
11. Schedule-Card Holder: Recessed or surface-mounted holder for pickup schedule card in center of bottom front portion of unit. Fabricate of same material and finish as front of unit.
12. Mailbag Hooks: Two aluminum or stainless-steel hooks at exterior front edge of bottom of surface-mounted units, spaced 15 to 17-1/2 inches (381 to 445 mm) apart, for supporting mailbags.
13. Mailbag Rack: Internal rack system for supporting mailbags within unit.

2.5 ACCESSORIES

- A. Directory for Mail Receptacles : Surface-mounted, front-opening unit, with clear glass or plastic window.



1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**

3. Framed, Top-Mount Unit for Mail Receptacles: Fabricate directory as framed, horizontal unit with modular sections having a **[24-name capacity (3 modules)][32-name capacity (4 modules)][40-name capacity (5 modules)]**; of same material[, size,] and finish as adjacent mail receptacles; mounted above mail receptacles[**as indicated on Drawings**].
4. Framed, Side-Mount Unit for Mail Receptacles: Fabricate directory as framed, horizontal unit with **[50-name capacity, 28 inches (711 mm)][60-name capacity, 33-3/8 inches (848 mm)][70-name capacity, 38-3/4 inches (984 mm)]** high; of same material and finish as adjacent mail receptacles; mounted alongside of mail receptacles[**as indicated on Drawings**].
5. Name Strips: **1/4-inch- (6-mm-)** high label tape.

- B. Key Keeper : Consisting of single compartment with door; interior compartment size not less than **[4-3/4 inches wide by 2-1/4 inches high by 1-1/2 inches deep (121 mm wide by 57 mm high by 38 mm deep)]<Insert dimensions>**, USPS approved.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**

- f. **[Knox Company]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[Knox Company]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **<Insert manufacturer's name>**
3. Mounting: **[Recessed][Surface mounted]**.
4. Style: Compartment door **[set within face frame][extending full width and height of unit, with no exposed frame]**.
5. Type of Operation: **[Loose key in box][Retractor reel with minimum 20-inch- (508-mm-) long chain][Push-button, 24-V switch in box]**.
6. Door Lock: Door prepared to receive lock furnished by local postmaster.
7. Exposed Materials: Fabricated from extruded or sheet aluminum.
- a. Anodic Finish: **[Clear][As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.
 - b. Baked-Enamel or Powder-Coated Finish: **[Black][Gold][Dark bronze][Medium bronze][Silver][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.
- C. Key Cabinet : Wall-mounted, **[metallic-coated]** steel cabinet with pivoting, key-holding panels and side-hinged door equipped with five-pin tumbler, cylinder-door lock and concealed, full-length flush hinge. Finish cabinet, panels, and door with baked-enamel or powder-coated finish. Key-control system consisting of key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Security Manufacturing Corporation]**
 - i. **[W. A. Charnstrom Company]**
 - j. **<Insert manufacturer's name>**
- 3. Capacity: Keys for **[150 percent of the number of]<Insert number>** mail-receptacle locks.
 - 4. Cross-Index System: Consisting of index cards for recording key information. Include three receipt forms for each key-holding hook.
 - 5. Baked-Enamel or Powder-Coated Finish: **[Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.

2.6 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
- B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.
- C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.
- E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.
- F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.
- G. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions[, **with Installer present,**] for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.
- B. Examine walls and other adjacent construction for suitable conditions before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install postal specialties level and plumb, according to manufacturer's written instructions.
 - 1. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer.
 - 2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
 - 3. Final acceptance of postal specialties served by the USPS depends on compliance with USPS requirements.
- B. Mail Receptacles: Install mail receptacles with center of tenant-door lock cylinders and bottom of compartments at the maximum and minimum heights above finished floor established by the USPS and manufacturer's written instructions.
 - 1. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.
- C. Pedestal-Mounted Postal Specialties: Anchor units with **1/2-inch- (13-mm-)** diameter, stainless-steel anchor bolts with hooked ends.
- D. Collection Boxes: Install collection boxes with **[centerline of mail slots][handle of hopper doors]** not more than **48 inches (1219 mm)** above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Arrange for USPS personnel to examine and test postal specialties served by the USPS after they have been installed according to USPS regulations.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.

10 - Specialties



- B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.
- C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.
- D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 10 55 00 00



SECTION 10 55 00 00A - PRIVATE-DELIVERY POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal mail receptacles.
2. Vertical mail receptacles.
3. Mail collection boxes.
4. Data distribution boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.

B. Shop Drawings: For postal specialties.

1. Include plans, elevations, sections, and attachment details.
2. Include identification sequence for compartments.
3. Include layout of identification text.
4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.

C. Samples for Verification: For each type of exposed finish, prepared on **6-by-6-inch- (150-by-150-mm-)** square Samples.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Key Blanks: **[50]<Insert number>** for every **<Insert number>** locks or fraction thereof, for each type of compartment-door lock installed.



1.6 DELIVERY, STORAGE, AND HANDLING

- A. Furnish lock keys with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.
- B. Deliver lock keys to Owner by registered mail or overnight package service with a record of each corresponding lock and key number.
- C. Deliver combination-lock combinations to Owner by registered mail or overnight package service with a record of each corresponding lock and combination.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of hardware[**including electrical components**].
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HORIZONTAL MAIL RECEPTACLES

- A. Front-Loading, Horizontal Mail Receptacles : Consisting of multiple compartments with fixed, solid compartment backs, enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Bommer Industries, Inc]**
 - d. **[Florence Corporation; Gibraltar Industries Company]**
 - e. **[Jayco Industries]**
 - f. **[Jensen Mailboxes Manufacturing Company]**
 - g. **[National Mailboxes; a division of NMHP, Inc.]**
 - h. **[Postal Products Unlimited, Inc.]**
 - i. **[Salsbury Industries]**
 - j. **[Security Manufacturing Corporation]**
 - k. **[W. A. Charnstrom Company]**
 - l. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[2B Global Inc.]**
 - b. **[American Eagle Mailbox Mfg. Corp.]**
 - c. **[Bommer Industries, Inc]**
 - d. **[Florence Corporation; Gibraltar Industries Company]**
 - e. **[Jayco Industries]**
 - f. **[Jensen Mailboxes Manufacturing Company]**
 - g. **[National Mailboxes; a division of NMHP, Inc.]**
 - h. **[Postal Products Unlimited, Inc.]**
 - i. **[Salsbury Industries]**
 - j. **[Security Manufacturing Corporation]**
 - k. **[W. A. Charnstrom Company]**
 - l. **<Insert manufacturer's name>**

3. Front-Loading Master Door: Braced and framed to hold compartment doors; with master-door lock and concealed, full-length, stainless-steel piano hinge on one side. Fabricate master door to remain open while mail is deposited.
 - a. Master-Door Lock:
 - 1) Manufacturer's standard five-pin tumbler, cylinder lock; with **[two][three]<Insert number>** keys.
 - 2) Cylinder lock keyed to building keying system; with **[two][three]<Insert number>** keys. Provide cylinders specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**

4. Compartments with Aluminum Doors: Manufacturer's standard compartments with extruded aluminum doors. Equip each with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide one compartment prepared for master-door lock[**and with outgoing mail slot**].
 - a. Compartments: **[Number and size as follows:]****[As indicated on Drawings, of the following sizes:]****[As indicated on Drawings.]**
 - 1) Size 1: Provide **<Insert number>** compartments with inside dimensions not less than **3 inches high by 6 inches wide by 15 inches deep (76 mm high by 152 mm wide by 381 mm deep)**.
 - 2) Size 2: Provide **<Insert number>** compartments with inside dimensions not less than **5 inches high by 3-1/2 inches wide by 15 inches deep (127 mm high by 89 mm wide by 381 mm deep)**.
 - 3) Size 3: Provide **<Insert number>** compartments with inside dimensions not less than **5 inches high by 7-1/2 inches wide by 15 inches deep (127 mm high by 191 mm wide by 381 mm deep)**.
 - 4) Size 4: Provide **<Insert number>** compartments with inside dimensions not less than **10-1/2 inches high by 3-1/2 inches wide by 15 inches deep (267 mm high by 89 mm wide by 381 mm deep)**.
 - 5) Size 5: Provide **<Insert number>** compartments with inside dimensions not less than **10-1/2 inches high by 7-1/2 inches wide by 15 inches deep (267 mm high by 191 mm wide by 381 mm deep)**.
 - b. Tenant Identification:
 - 1) **2-inch-wide by 5/8-inch- (51-mm-wide by 16-mm-) high, clear-plastic cardholder**

- set in recessed slot in face of compartment door. Provide cardboard strip and self-adhesive numbers.
 - 2) Laminated, black plastic tabs, engraved with identification and adhesively applied to face of compartment door.
 - 3) Identification engraved into face of compartment door.
 5. Compartments with Ornamental Metal Doors: Manufacturer's standard compartments with ornamental doors fabricated from solid, die-cast **[brass][zinc]**. Equip each with **[glass window]**, lock, nameplate, and two hinges.
 - a. Compartments: **[Number and size as follows:]****[As indicated on Drawings, of the following sizes:]****[As indicated on Drawings.]**
 - 1) Size 1: Provide **<Insert number>** compartments **15 inches (381 mm)** deep with doors **5 inches high by 3-1/2 inches wide (127 mm high by 89 mm wide)**.
 - 2) Size 2: Provide **<Insert number>** compartments **15 inches (381 mm)** deep with doors **6 inches high by 5-1/2 inches wide (152 mm high by 140 mm wide)**.
 - 3) Size 3: Provide **<Insert number>** compartments **15 inches (381 mm)** deep with doors **6 inches high by 11 inches wide (152 mm high by 279 mm wide)**.
 6. Compartment-Door Locks:
 - a. Five-pin tumbler, cylinder **[cam][spring-latch-type]** locks capable of at least 1000 key changes; with **[two][three]<Insert number>** keys for each compartment door. Key each compartment differently.
 - b. Removable core locks, furnished by Owner and installed as the Work of this Section.
 - c. Spring-latch-type lock designed to accommodate cylinders keyed to building keying system; with **[two][three]<Insert number>** keys for each compartment door. Provide cylinders specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**
 - d. Three-digit, single-dial, combination locks with spring latch and automatic throw off. Set each compartment with different combination.
 7. Frames: Ganged and nested units, with cardholder and blank cards for tenant's identification behind each compartment.
 8. Snap-on Trim: Fabricated from the same material and finish as compartment doors.
 9. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
 10. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Anodic Finish: **[Clear]<Insert color>**.
 - b. Baked-Enamel or Powder-Coated Finish: **[Black][Dark bronze][Gold][Medium bronze][Silver][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.
 11. Brass Finish: **[Buffed finish, lacquered][Hand-rubbed finish, lacquered][Brushed satin, lacquered]<Insert finish>**.
 12. Zinc Finish: Manufacturer's standard powder-coated finish, **[tan]<Insert color>**.
- B. Rear-Loading, Horizontal Mail Receptacles : Consisting of multiple compartments enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from rear of unit with accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [2B Global Inc.]
 - b. [American Eagle Mailbox Mfg. Corp.]
 - c. [Bommer Industries, Inc]
 - d. [Florence Corporation; Gibraltar Industries Company]
 - e. [Jayco Industries]
 - f. [Jensen Mailboxes Manufacturing Company]
 - g. [National Mailboxes; a division of NMHP, Inc.]
 - h. [Postal Products Unlimited, Inc.]
 - i. [Salsbury Industries]
 - j. [Security Manufacturing Corporation]
 - k. [W. A. Charnstrom Company]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [2B Global Inc.]
 - b. [American Eagle Mailbox Mfg. Corp.]
 - c. [Bommer Industries, Inc]
 - d. [Florence Corporation; Gibraltar Industries Company]
 - e. [Jayco Industries]
 - f. [Jensen Mailboxes Manufacturing Company]
 - g. [National Mailboxes; a division of NMHP, Inc.]
 - h. [Postal Products Unlimited, Inc.]
 - i. [Salsbury Industries]
 - j. [Security Manufacturing Corporation]
 - k. [W. A. Charnstrom Company]
 - l. <Insert manufacturer's name>
3. Rear-Loading Cover: **[Not required][Lift-off rear cover fabricated from extruded aluminum or aluminum sheet, finished to match front of unit].**
4. Rear-Loading Door: Side hinged, fabricated from extruded aluminum or aluminum sheet, **finished to match front of unit**; with full-length, stainless-steel piano hinge on one side and **[positive-latching][locking]** mechanism on the other. Fabricate rear-loading door to open not less than 90 degrees and to remain open while mail is deposited.
- a. Rear-Door Lock:
 - 1) Manufacturer's standard five-pin tumbler, cylinder lock; with **[two][three]<Insert number>** keys.
 - 2) Cylinder lock keyed to building keying system; with **[two][three]<Insert number>** keys. Provide cylinders specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**
5. Compartments with Aluminum Doors: Manufacturer's standard compartments with doors fabricated from extruded aluminum. Equip each with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide one compartment prepared for master-door lock **[and with outgoing mail slot].**
- a. Compartments: **[Number and size as follows:][As indicated on Drawings, of the following sizes:][As indicated on Drawings.]**

- 1) Size 1: Provide <Insert number> compartments with inside dimensions not less than 3 inches high by 6 inches wide by 15 inches deep (76 mm high by 152 mm wide by 381 mm deep).
 - 2) Size 2: Provide <Insert number> compartments with inside dimensions not less than 5 inches high by 3-1/2 inches wide by 15 inches deep (127 mm high by 89 mm wide by 381 mm deep).
 - 3) Size 3: Provide <Insert number> compartments with inside dimensions not less than 5 inches high by 7-1/2 inches wide by 15 inches deep (127 mm high by 191 mm wide by 381 mm deep).
 - 4) Size 4: Provide <Insert number> compartments with inside dimensions not less than 10-1/2 inches high by 3-1/2 inches wide by 15 inches deep (267 mm high by 89 mm wide by 381 mm deep).
 - 5) Size 5: Provide <Insert number> compartments with inside dimensions not less than 10-1/2 inches high by 7-1/2 inches wide by 15 inches deep (267 mm high by 191 mm wide by 381 mm deep).
 - 6) Tenant Identification: 2-inch-wide by 5/8-inch- (51-mm-wide by 16-mm-) high, clear-plastic cardholder set in recessed slot in face of compartment door. Provide cardboard strip and self-adhesive numbers.
 - 7) Laminated, black plastic tabs, engraved with identification and adhesively applied to face of compartment door.
 - 8) Identification engraved into face of compartment door.
6. Compartments with Ornamental Metal Doors: Manufacturer's standard compartments with ornamental doors fabricated from [brass][zinc]. Equip each with [glass window,] lock, nameplate, and two hinges.
- a. Compartments: [Number and size as follows:][As indicated on Drawings, of the following sizes:][As indicated on Drawings.]
 - 1) Size 1: Provide <Insert number> compartments 15 inches (381 mm) deep with doors 5 inches high by 3-1/2 inches wide (127 mm high by 89 mm wide).
 - 2) Size 2: Provide <Insert number> compartments 15 inches (381 mm) deep with doors 6 inches high by 5-1/2 inches wide (152 mm high by 140 mm wide).
 - 3) Size 3: Provide <Insert number> compartments 15 inches (381 mm) deep with doors 6 inches high by 11 inches wide (152 mm high by 279 mm wide).
7. Compartment-Door Locks:
- a. Five-pin tumbler, cylinder [cam][spring-latch-type] locks capable of at least 1000 key changes; with [two][three]<Insert number> keys for each compartment door. Key each compartment differently.
 - b. Removable core locks, furnished by Owner and installed as the Work of this Section.
 - c. Spring-latch-type lock designed to accommodate cylinders keyed to building keying system; with [two][three]<Insert number> keys for each compartment door. Provide cylinders specified in [Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]
 - d. Three-digit, single-dial, combination locks with spring latch and automatic throw off. Set each compartment with different combination.
8. Frames: Ganged and nested units, with cardholder and blank cards for tenant's identification behind each compartment.
9. Snap-on Trim: Fabricated from the same material and finish as compartment doors.
10. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
11. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:

- a. Anodic Finish: **[Clear]<Insert color>**.
- b. Baked-Enamel or Powder-Coated Finish: **[Black][Dark bronze][Gold][Medium bronze][Silver][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.
- 12. Brass Finish: **[Buffed finish, lacquered][Hand-rubbed finish, lacquered][Brushed satin, lacquered]<Insert finish>**.
- 13. Zinc Finish: Manufacturer's standard powder-coated finish, **[tan]<Insert color>**.

2.2 VERTICAL MAIL RECEPTACLES

- A. Vertical Mail Receptacles : Consisting of vertical compartments enclosed within wall box; with inside dimensions of each compartment not less than **15 inches high by 5 inches wide by 6 inches deep (381 mm high by 127 mm wide by 152 mm deep)**. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and tilting inner compartments forward as a group. Provide access to each compartment for removing mail by swinging compartment door.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[National Mailboxes; a division of NMHP, Inc.]**
 - e. **[Postal Products Unlimited, Inc.]**
 - f. **[Salsbury Industries]**
 - g. **[Security Manufacturing Corporation]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[National Mailboxes; a division of NMHP, Inc.]**
 - e. **[Postal Products Unlimited, Inc.]**
 - f. **[Salsbury Industries]**
 - g. **[Security Manufacturing Corporation]**
 - h. **[W. A. Charnstrom Company]**
 - i. **<Insert manufacturer's name>**
 - 3. Mounting: **[Recessed][Semirecessed with mounting frame][Surface mounted with mounting frame][As indicated on Drawings]**.
 - 4. Compartments: Provide **[three]<Insert number up to seven>[as indicated on Drawings]**.
 - 5. Compartment Doors and Frames: Fabricated from striated, extruded aluminum. Equip each compartment door with lock, slot in face of door to receive tenant identification, and concealed, full-length, flush hinge on one side. **[Provide one double-wide compartment with outgoing mail slot.]**
 - a. Tenant Identification: **[Cardboard name and number tab][Laminated, black plastic tabs,**



- engraved with identification].**
- b. Compartment-Door Locks:
- 1) Five-pin tumbler, cylinder **[cam][spring-latch-type]** locks capable of at least 1000 key changes; with **[two][three]<Insert number>** keys for each compartment door. Key each compartment differently.
 - 2) Removable core locks, furnished by Owner and installed as the Work of this Section.
 - 3) Spring-latch-type lock designed to accommodate cylinders keyed to building keying system; with **[two][three]<Insert number>** keys for each compartment door. Provide cylinders specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**
6. Frames: Ganged and nested units, with cardholder and blank cards for tenant's identification within each compartment.
7. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
8. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
- a. Anodic Finish: **[Clear][Gold][As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.
 - b. Baked-Enamel or Powder-Coated Finish: **[Aluminum][Black][Brass][Dark bronze][Gold][Green][Ivory][Medium bronze][Silver][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.

2.3 MAIL COLLECTION BOXES

- A. Mail Collection Boxes : Consisting of single compartment of same depth as horizontal mail receptacles, enclosed within wall box, with slot in top of front to receive mail. Provide door for collecting mail from front of unit.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**
 - c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Salsbury Industries]**
 - i. **[Security Manufacturing Corporation]**
 - j. **[W. A. Charnstrom Company]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Eagle Mailbox Mfg. Corp.]**
 - b. **[Bommer Industries, Inc]**

- c. **[Florence Corporation; Gibraltar Industries Company]**
 - d. **[Jayco Industries]**
 - e. **[Jensen Mailboxes Manufacturing Company]**
 - f. **[National Mailboxes; a division of NMHP, Inc.]**
 - g. **[Postal Products Unlimited, Inc.]**
 - h. **[Salsbury Industries]**
 - i. **[Security Manufacturing Corporation]**
 - j. **[W. A. Charnstrom Company]**
 - k. **<Insert manufacturer's name>**
- 3. Height: Sized to match height of **[four][five][six][seven]** horizontal mail receptacles.
 - 4. Mounting: **[Recessed][Semirecessed][Surface mounted]**.
 - 5. Compartment Doors and Frames: Fabricated from extruded aluminum or aluminum sheet that is **[full height of unit including][in portion of unit below]** mail slot, and equipped with lock and concealed, continuous side hinge.
 - a. Door Lock: Cylinder lock keyed to building keying system; with **[two][three]<Insert number>** keys. Provide cylinders specified in **[Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]**
 - b. Identification: Engrave face of compartment door with **1-inch- (25-mm-)** high letters as follows: **"[LETTERS][OUTGOING MAIL][OFFICE]<Insert text>."**
 - 6. Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Anodic Finish: **[Clear]<Insert color>**.
 - b. Baked-Enamel or Powder-Coated Finish: **[Black][Dark bronze][Gold][Medium bronze][Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>**.

2.4 DATA DISTRIBUTION BOXES

- A. Data Distribution Boxes : Consisting of multiple compartments contained within enclosure.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[National Mailboxes; a division of NMHP, Inc.]**
 - b. **[Salsbury Industries]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[National Mailboxes; a division of NMHP, Inc.]**
 - b. **[Salsbury Industries]**
 - c. **<Insert manufacturer's name>**
 - 3. Enclosure Configuration: **[Freestanding][Recessed in wall][Recessed in wall and installed between rack ladders]**.
 - 4. Compartment Access: Provide access to compartments as follows:
 - a. For Distributing Incoming Mail from Front of Unit: Mail slot in each compartment door.



- b. For Distributing Incoming Mail from Rear of Unit: Open backs[**with aluminum cover finished to match front of unit**].
 - c. For Removing Mail: Unlocking and swinging compartment door.
- 5. Compartments: **[Number and size as follows:]**[As indicated on Drawings, of the following sizes:][As indicated on Drawings.]
 - a. Size 1: Provide **<Insert number>** compartments with inside dimensions not less than **5 inches high by 12-1/2 inches wide by 15 inches deep (127 mm high by 318 mm wide by 381 mm deep)**.
 - b. **<Insert compartment description>**.
- 6. Compartment Doors: Equip with lock and concealed, continuous hinge.
 - a. Door Locks:
 - 1) Five-pin tumbler, cylinder **[cam]****[spring-latch-type]** locks capable of at least 1000 key changes; with **[two]****[three]****<Insert number>** keys for each compartment door. Key each compartment differently.
 - 2) Three-digit, single-dial, combination locks with spring latch and automatic throw off. Set each compartment with different combination.
- 7. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
- 8. Exposed Materials: Fabricated from steel sheet or aluminum with powder-coat finish.
- 9. Rack Ladders: Aluminum or steel with manufacturer's standard finish.
- 10. Powder-Coated Finish: **[Silver]****[Silver with black trim]****[Silver with slate trim]****[Sandalwood with sand trim]****[Color as indicated by manufacturer's designations]****[Color as selected by Architect from manufacturer's full range]****<Insert color>**.

2.5 ACCESSORIES

- A. Directory for Mail Receptacles : Surface-mounted, front-opening unit, with clear glass or plastic window.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Bommer Industries, Inc]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jensen Mailboxes Manufacturing Company]**
 - d. **[National Mailboxes; a division of NMHP, Inc.]**
 - e. **[Salsbury Industries]**
 - f. **[Security Manufacturing Corporation]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Bommer Industries, Inc]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[Jensen Mailboxes Manufacturing Company]**

- d. [National Mailboxes; a division of NMHP, Inc.]
 - e. [Salsbury Industries]
 - f. [Security Manufacturing Corporation]
 - g. <Insert manufacturer's name>
3. Framed, Top-Mount Unit for Horizontal Mail Receptacles: Fabricate directory as framed, horizontal unit with modular sections having a [24-name capacity (3 modules)][32-name capacity (4 modules)][40-name capacity (5 modules)]; of same material[, size,] and finish as adjacent mail receptacles; mounted above mail receptacles[as indicated on Drawings].
 4. Framed, Side-Mount Unit for Horizontal Mail Receptacles: Fabricate directory as framed, horizontal unit with [50-name capacity, 28 inches (711 mm)][60-name capacity, 33-3/8 inches (848 mm)][70-name capacity, 38-3/4 inches (984 mm)] high; of same material and finish as adjacent mail receptacles; mounted at side of mail receptacles[as indicated on Drawings].
 5. Framed, Side-Mount Unit for Vertical Mail Receptacles: Fabricate directory as framed, vertical unit with modular sections having a [40-name capacity (1 module)][80-name capacity (2 modules)][120-name capacity (3 modules)][160-name capacity (4 modules)][200-name capacity (5 modules)]; of same size, material, and finish as adjacent vertical mail compartment doors unless otherwise indicated.
 6. Insert Units for Vertical Mail Receptacles: Fabricate directory as modular inserts having a [40-name capacity (1 module)][80-name capacity (2 modules)][120-name capacity (3 modules)][160-name capacity (4 modules)][200-name capacity (5 modules)]; of same size, material, and finish as adjacent vertical mail compartment doors unless otherwise indicated.
 7. Provide name strips made of 1/4-inch- (6-mm-) high, label tape.
- B. Key Cabinet : Wall-mounted,[**metallic-coated**] steel cabinet with pivoting, key-holding panels and side-hinged door equipped with five-pin tumbler, cylinder door lock and concealed, full-length flush hinge. Finish cabinet, panels, and door with baked-enamel or powder-coated finish. Provide key control system consisting of key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Florence Corporation; Gibraltar Industries Company]
 - b. [Jayco Industries]
 - c. [National Mailboxes; a division of NMHP, Inc.]
 - d. [Postal Products Unlimited, Inc.]
 - e. [Salsbury Industries]
 - f. [Security Manufacturing Corporation]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Florence Corporation; Gibraltar Industries Company]
 - b. [Jayco Industries]
 - c. [National Mailboxes; a division of NMHP, Inc.]
 - d. [Postal Products Unlimited, Inc.]
 - e. [Salsbury Industries]
 - f. [Security Manufacturing Corporation]
 - g. <Insert manufacturer's name>
 3. Capacity: Keys for [150 percent of the number of]<Insert number> mail-receptacle locks.



4. Cross-Index System: Consisting of index cards for recording key information. Include three receipt forms for each key-holding hook.
 5. Baked-Enamel or Powder-Coated Finish: **[Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>.**
- C. Letter Drops (Through Wall) : Consisting of **11-inch-wide by 3-1/2-inch- (279-mm-wide by 89-mm-)** high, top-hinged, spring-loaded flap that pivots inward, held in place by **1-inch- (25-mm-)** wide face frame. Fabricated from **1/4-inch- (6-mm-)** thick aluminum or steel, with exposed surfaces finished to match adjacent mail receptacles.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Bommer Industries, Inc]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[National Mailboxes; a division of NMHP, Inc.]**
 - d. **[Postal Products Unlimited, Inc.]**
 - e. **[Salsbury Industries]**
 - f. **[Security Manufacturing Corporation]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Bommer Industries, Inc]**
 - b. **[Florence Corporation; Gibraltar Industries Company]**
 - c. **[National Mailboxes; a division of NMHP, Inc.]**
 - d. **[Postal Products Unlimited, Inc.]**
 - e. **[Salsbury Industries]**
 - f. **[Security Manufacturing Corporation]**
 - g. **<Insert manufacturer's name>**
 3. Sleeve: Provide **[metallic-coated]** steel wall sleeve for full depth of wall.
 4. Finished Frame: Provide finished face frame on back side of wall opening.
 5. Identification: Engrave face of swinging flap with **1-inch- (25-mm-)** high letters as follows: **"[LETTERS][OUTGOING MAIL]<Insert text>."**
 6. Exposed Material and Finish: **[Exposed surfaces fabricated from same material and finish as adjacent mail receptacles]<Insert material and finish>.**
- D. Package Depository (Through Wall) : Consisting of **1/4-inch- (6-mm-)** thick, aluminum or steel faceplate and through-the-wall hopper door **[with hinged baffle]** allowing receipt of packages; fabricated from **1/4-inch- (6-mm-)** thick aluminum or steel.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Florence Corporation; Gibraltar Industries Company]**
 - b. **[Jayco Industries]**
 - c. **[National Mailboxes; a division of NMHP, Inc.]**
 - d. **[Postal Products Unlimited, Inc.]**

- e. **[Salsbury Industries]**
 - f. **[Security Manufacturing Corporation]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Florence Corporation; Gibraltar Industries Company]**
 - b. **[Jayco Industries]**
 - c. **[National Mailboxes; a division of NMHP, Inc.]**
 - d. **[Postal Products Unlimited, Inc.]**
 - e. **[Salsbury Industries]**
 - f. **[Security Manufacturing Corporation]**
 - g. **<Insert manufacturer's name>**
3. Hopper Door: Equipped with door pull and concealed, full-length bottom hinge; with opening size **[not less than 15 inches wide by 6-1/2 inches high (381 mm wide by 165 mm high)]****[as indicated on Drawings]****<Insert dimensions>**.
4. Sleeve: Provide **[metallic-coated]** steel wall sleeve for full depth of wall.
5. Slowdown: Provide steel slowdown ramp on back side of wall opening.
6. Identification: Engrave face of hopper door with **1-inch- (25-mm-)** high letters as follows:
"[LETTERS]<Insert text>."
7. Finish: Exposed surfaces finished same as mail receptacles.
8. Aluminum Finish: Finish surfaces exposed to view as follows:
- a. Anodic Finish: **[Clear]****[As indicated by manufacturer's designations]****[As selected by Architect from manufacturer's full range]****<Insert color>**.
 - b. Baked-Enamel or Powder-Coated Finish: **[Dark bronze]****[Gold]****[Color as indicated by manufacturer's designations]****[Color as selected by Architect from manufacturer's full range]****<Insert color>**.
9. Steel Finish: Finish surfaces exposed to view with baked-enamel or powder-coated finish; **[color as indicated by manufacturer's designations]****[color as selected by Architect from manufacturer's full range]****<Insert color>**.

2.6 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
- B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.
- C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.
- E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.
- F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical

joints. Provide subframes and reinforcement as required for a complete system to support loads.

- G. Fabricate rack ladders to support indicated number of units to form a column of units.
- H. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions[, **with Installer present,**] for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.
- B. Examine walls and other adjacent construction for suitable conditions where units will be installed.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install postal specialties level and plumb, according to manufacturer's written instructions and roughing-in drawings.
 - 1. Where dissimilar metals are in permanent contact with each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer for this purpose.
 - 2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Horizontal Mail Receptacles: Install horizontal mail receptacles with center of tenant-door lock cylinders not more than **48 inches (1219 mm)** and bottom of receptacles not less than **15 inches (381 mm)** above finished floor.
 - 1. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.
 - 2. Install and align two rack ladders for the first column of mail receptacles and one rack ladder for

each additional adjacent column of mail receptacles.

- C. Vertical Mail Receptacles: Install vertical mail receptacles with center of master lock cylinder not more than **48 inches (1219 mm)** and bottom of receptacles not less than **15 inches (381 mm)** above finished floor.
- D. Pedestal-Mounted Postal Specialties: Anchor units with **1/2-inch- (13-mm-)** diameter, **[galvanized][stainless]**-steel anchor bolts with hooked ends.
- E. Mail Collection Boxes: Install collection boxes with **[centerline of mail slots][handle of hopper doors]** not more than **48 inches (1219 mm)** above finished floor.
- F. Freestanding Data Distribution Boxes: Locate freestanding data distribution boxes at locations indicated **[or, if not indicated, as directed by Architect]**.
- G. Rack-Ladder Data Distribution Boxes: Install and align two rack ladders for the first column of data distribution boxes and one rack ladder for each additional adjacent column of data distribution boxes.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.
- C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.
- D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 10 55 00 00A



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Task	Specification	Specification Description
10 55 23 00	10 55 00 00	USPS-Delivery Postal Specialties
10 55 23 00	10 55 00 00a	Private-Delivery Postal Specialties
10 55 23 23	10 55 00 00	USPS-Delivery Postal Specialties
10 55 23 23	10 55 00 00a	Private-Delivery Postal Specialties
10 55 23 26	10 55 00 00	USPS-Delivery Postal Specialties
10 55 23 26	10 55 00 00a	Private-Delivery Postal Specialties
10 55 26 00	10 55 00 00	USPS-Delivery Postal Specialties
10 55 26 00	10 55 00 00a	Private-Delivery Postal Specialties



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SECTION 10 56 13 00 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Case-type metal storage shelving.
2. Four-post metal storage shelving.
3. Wire-type, four-post metal storage shelving.
4. Post-and-beam metal storage shelving.

B. Related Requirements:

1. Section 114000 "Foodservice Equipment" for metal shelving in kitchen, pantry, and refrigerated spaces.
2. Section 115123 "Library Stack Systems" for library shelving systems including cantilever-bracket shelving supported by wall-mounted standards.
3. Section 123553.13 "Metal Laboratory Casework" for metal shelving in laboratories.
4. Section 123570 "Healthcare Casework" for metal shelving in central sterile supply rooms, clean utility rooms, and similar spaces for the storage of medical instruments and supplies.

1.2 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.



- C. Shop Drawings: For metal storage shelving.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include installation details of connectors, lateral bracing, and special bracing.
- D. Samples: For each type of metal storage shelving and for each color specified, in the following sizes:
 - 1. Vertical Supports: **12 inches (305 mm)** tall.
 - 2. Shelves: Full size, but not more than **24 inches wide by 12 inches deep (610 mm wide by 305 mm deep)**.
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.
- E. Samples for Initial Selection: For each type of metal storage shelving with factory-applied color finishes.
 - 1. Include Samples of accessories involving color selection.
- F. Samples for Verification: For the following component, of size indicated below:
 - 1. Vertical Supports: **12 inches (305 mm)** tall.
 - 2. Shelves: Full size, but not more than **24 inches wide by 12 inches deep (610 mm wide by 305 mm deep)**.
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.
- G. Product Schedule: For metal storage shelving. [**Use same designations indicated on Drawings.**]
- H. Delegated Design Submittals: For seismic restraint of metal storage shelving.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For metal storage shelving, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of metal storage shelving.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Shelves: Full-size units equal to **[5]<Insert number>** percent of amount installed for each type indicated, but no fewer than **[5]<Insert number>** shelves.
 - 2. Shelf-to-Post Connectors: Full-size units equal to **[5]<Insert number>** percent of amount installed for each type indicated, but no fewer than **[10]<Insert number>** connectors.

3. Shelf-Label Holders: Full-size units equal to [5]<Insert number> percent of amount installed for each type indicated, but no fewer than [10]<Insert number> holders.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Metal storage shelving to withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirement>.
 1. Seismic Component Importance Factor: [1.5][1.0].
- C. Sustainable Design Performance:
- D. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- F. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

2.2 CASE-TYPE METAL STORAGE SHELVING

- A. Case-Type Metal Storage Shelving: Complying with MH 28.1; freestanding units and field assembled from factory-formed components. Shelves span between two independent supporting sheet metal end panels that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.



1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Borroughs Corporation]
- b. [EQUIPTO]
- c. [Karp Associates, Inc]
- d. [Lyon LLC]
- e. [Montel Inc.]
- f. [Republic Storage Systems, LLC]
- g. [Tennsco]
- h. [UNICOR, Federal Prison Industries, Inc. (FPI)]
- i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Borroughs Corporation]
- b. [EQUIPTO]
- c. [Karp Associates, Inc]
- d. [Lyon LLC]
- e. [Montel Inc.]
- f. [Republic Storage Systems, LLC]
- g. [Tennsco]
- h. [UNICOR, Federal Prison Industries, Inc. (FPI)]
- i. <Insert manufacturer's name>

- B. Load-Carrying Capacity per Shelf: [200 lb (91 kg)][As indicated on Drawings]<Insert load>, uniformly distributed.

- C. End Panels with Concealed Perforations: Fabricated from cold-rolled steel sheet, perforations at front and back edges at [manufacturer's standard spacing][1 inch (25 mm) o.c.] for receiving adjustable shelf clips.

1. Steel Sheet Thickness, Nominal: [0.036 inch (0.91 mm)][As required for load-carrying capacity per shelf and number of shelves]<Insert thickness>.
2. Adjustable Shelf Clips: Cold-rolled steel, nominal thickness [0.036-inch- (0.91-mm-)][as required for load-carrying capacity per shelf]<Insert thickness>; with projections designed to engage at least two perforations in end panels.

- D. End Panels with Horizontal Slots: Fabricated from cold-rolled steel sheet; slots spaced at [manufacturer's standard spacing][1 inch (25 mm) o.c.][1-1/2 inches (38 mm) o.c.] for supporting shelves.

1. Steel Sheet Thickness, Nominal: [0.036 inch (0.91 mm)][As required for load-carrying capacity per shelf and number of shelves]<Insert thickness>.

- E. Back Panel: One piece, fabricated from cold-rolled steel sheet.

- F. Shelves: Fabricated from cold-rolled steel sheet. Fabricate shelves with vertical front that is flanged and returned.

1. Shelf-Divider Slots: [2 inches (51 mm) o.c.]<Insert requirements>.

2. Steel Sheet Thickness, Nominal: [0.048 inch (1.21 mm)][As required for load-carrying capacity per shelf and number of shelves]<Insert thickness>.
- G. Shelf Quantity: [Three][Four][Five][Six]<Insert number> shelves per shelving unit in addition to top and bottom shelf.
- H. Base: Closed front, with base strips fabricated from same material and with same finish as end panels.
- I. Overall Unit Width: [30 inches (762 mm)][36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)]<Insert dimension>.
- J. Overall Unit Depth: [12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]<Insert dimension>.
- K. Overall Unit Height: [72 inches (1829 mm)][84 inches (2134 mm)][96 inches (2438 mm)]<Insert dimension>.
- L. Accessories:
 1. Finished End Panels: Fabricated as [solid][perforated]<Insert description> full-height panels from same material and with same finish as end panels, with trim along edges abutting end panels and top shelf.
 2. Shelf Dividers: Fabricated from same material and with same finish as shelves; [full-height][angle][tapered][sliding]<Insert description> type.
 3. Bins: [Fabricated from same material and with same finish as shelves][Plastic]; [size as indicated on Drawings]<Insert dimensions>.
 4. Shelf-Label Holders: [Clear][Colored] plastic, designed to clip onto front edge of shelf.
- M. Steel Finish: [Baked enamel][or][powder coat].
 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.3 FOUR-POST METAL STORAGE SHELIVING

- A. Four-Post Metal Storage Shelving : Complying with MH 28.1 and field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Aurora Storage Products, Inc.]
 - b. [Borroughs Corporation]
 - c. [Durham Manufacturing Company (The)]
 - d. [Edsal Manufacturing Company, Inc.]
 - e. [EQUIPTO]
 - f. [Excalibur Wood Products]
 - g. [Hodge]
 - h. [Interlake Mecalux]
 - i. [Jeter; a TAB Company]
 - j. [Karp Associates, Inc]



- k. [List Industries Inc.]
 - l. [Lyon LLC]
 - m. [Montel Inc.]
 - n. [Penco Products, Inc.]
 - o. [Republic Storage Systems, LLC]
 - p. [Rousseau Metal Inc]
 - q. [Safco Products Company]
 - r. [Schaefer Systems International, Inc]
 - s. [Spacefile International Corp.]
 - t. [Spacesaver Corporation]
 - u. [Tennsco]
 - v. [UNICOR, Federal Prison Industries, Inc. (FPI)]
 - w. [Western Pacific Storage Systems]
 - x. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aurora Storage Products, Inc.]
 - b. [Borroughs Corporation]
 - c. [Durham Manufacturing Company (The)]
 - d. [Edsal Manufacturing Company, Inc.]
 - e. [EQUIPTO]
 - f. [Excalibur Wood Products]
 - g. [Hodge]
 - h. [Interlake Mecalux]
 - i. [Jeter; a TAB Company]
 - j. [Karp Associates, Inc]
 - k. [List Industries Inc.]
 - l. [Lyon LLC]
 - m. [Montel Inc.]
 - n. [Penco Products, Inc.]
 - o. [Republic Storage Systems, LLC]
 - p. [Rousseau Metal Inc]
 - q. [Safco Products Company]
 - r. [Schaefer Systems International, Inc]
 - s. [Spacefile International Corp.]
 - t. [Spacesaver Corporation]
 - u. [Tennsco]
 - v. [UNICOR, Federal Prison Industries, Inc. (FPI)]
 - w. [Western Pacific Storage Systems]
 - x. <Insert manufacturer's name>
3. Load-Carrying Capacity per Shelf: [350 lb (159 kg)][700 lb (318 kg)][1500 lb (680 kg)][As indicated on Drawings]<Insert load>.
4. Posts: Fabricated from hot-rolled steel; in [angle][offset-angle][beaded][T][tubular T][V][box][manufacturer's standard] shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive shelf-to-post connectors.
- a. Unit Configuration: Configure shelving units as [individual, freestanding][starter- and add-on unit] assemblies.
 - 1) Add-On Shelf Posts: Fabricated from hot-rolled steel, [T][manufacturer's standard]<Insert requirements> shape; perforated to match main posts.

- b. Post Base: **[Bolt leveler][Adjustable steel floor plate, drilled for floor anchors]**.
5. Bracing: Manufacturer's standard, **[single][or][double]** diagonal cross bracing.
 - a. Location: At unit **[back][and][ends]** as required for stability, load-carrying capacity of shelves, and number of shelves indicated.
6. Back Panel: **[One piece][Two half panels]** fabricated from cold-rolled steel sheet.
 - a. Steel Sheet Thickness, Nominal: **[0.024 inch (0.61 mm)][As required for load-carrying capacity per shelf<Insert thickness>]**.
7. End Panels: Fabricated from cold-rolled steel sheet.
 - a. Steel Sheet Thickness, Nominal: **[0.024 inch (0.61 mm)][As required for load-carrying capacity per shelf<Insert thickness>]**.
8. Solid-Type Shelves:
 - a. Steel Sheet: Nominal thickness **[0.030 inch (0.76 mm)][0.036 inch (0.91 mm)][0.048 inch (1.21 mm)][as required for load-carrying capacity per shelf<Insert thickness>]**.
 - b. Metallic-Coated Steel Sheet: Nominal thickness **[0.034 inch (0.86 mm)][0.040 inch (1.02 mm)][0.052 inch (1.32 mm)][as required for load-carrying capacity per shelf<Insert thickness>]**.
 - c. Slots or Holes for Shelf Dividers: **[2 inches (51 mm)][3 inches (76 mm)]<Insert dimension> o.c.**
 - d. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
 - e. Fabricate fronts and backs of shelves with vertical edges that are flanged and returned, with edges reinforced with steel **[bars][angles][or][channels]**.
9. Framed-Type Wire Shelves: **[Steel][Metallic-coated-steel]** wire; with shelf frame fabricated from same material and with same finish as posts.
10. Truss-Type Wire Shelves: **[Steel][Metallic-coated-steel][Stainless steel][Manufacturer's standard, chrome-plated]** wire-over-wire construction, with downturned wire truss edges.
11. Shelf Quantity: **[Three][Four][Five][Six]<Insert number>** shelves per shelving unit in addition to top and bottom shelf.
12. Shelf-to-Post Connectors: **[Mechanical fasteners (nuts and bolts)][Compression clips][Support clips][Containment clips][Horizontal supports with rivet connectors to post][Manufacturer's standard connectors]<Insert type>]**.
13. Base: **[Open, with exposed post legs][Closed, with base strips fabricated from same material and with same finish as shelving]**.
14. Overall Unit Width: **[30 inches (762 mm)][36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)]<Insert dimension>**, inclusive of two end posts.
15. Overall Unit Depth: **[12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]<Insert dimension>]**.
16. Overall Unit Height: **[72 inches (1829 mm)][84 inches (2134 mm)][96 inches (2438 mm)]<Insert dimension>]**.
17. Accessories:
 - a. Finished End Panels: Fabricated as **[solid][perforated]<Insert description>** full-height panels from manufacturer's standard thickness cold-rolled steel sheet and with same finish as posts, with trim for a finished appearance along edges abutting posts and top shelf.
 - b. Shelf Dividers: Fabricated from same material and with same finish as shelves; **[full-height][angle][tapered][sliding]<Insert description>** type.
 - c. Bins: Fabricated from same material and with same finish as shelves; **[size as indicated]**



- on Drawings]<Insert dimensions>.**
- d. Shelf-Label Holders: **[Clear][Colored]** plastic, designed to clip onto front edge of shelf.
18. Steel Finish: **[Baked enamel][or][powder coat]**.
- a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
- B. Wire-Type, Four-Post Metal Storage Shelving : Complying with MH 28.1; field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMCO Corporation]**
 - b. **[Aurora Storage Products, Inc.]**
 - c. **[Gillis Associated Industries]**
 - d. **[InterMetro Industries Corporation; an Ali Group Company]**
 - e. **[Lyon LLC]**
 - f. **[Nexel Industries; Global Industrial Storage Solutions]**
 - g. **[Safco Products Company]**
 - h. **[Spacesaver Corporation]**
 - i. **[Tennsco]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AMCO Corporation]**
 - b. **[Aurora Storage Products, Inc.]**
 - c. **[Gillis Associated Industries]**
 - d. **[InterMetro Industries Corporation; an Ali Group Company]**
 - e. **[Lyon LLC]**
 - f. **[Nexel Industries; Global Industrial Storage Solutions]**
 - g. **[Safco Products Company]**
 - h. **[Spacesaver Corporation]**
 - i. **[Tennsco]**
 - j. **<Insert manufacturer's name>**
 3. Load-Carrying Capacity per Shelf: **[200 lb (91 kg)][600 lb (272 kg)][1200 lb (544 kg)][As indicated on Drawings]<Insert load>**, uniformly distributed.
 4. Posts: Fabricated from **1-inch- (25-mm-)** OD, **[square][round]** tubing of indicated material; with grooves or notches at **1 inch (25 mm)** o.c. to receive shelf-to-post connectors. Label posts with numbers at not less than **2 inches (51 mm)** o.c. for determining shelf height.
 - a. Post Material: **[Steel][Stainless steel]**.
 - b. Post Base: **[Bolt leveler][Adjustable steel floor plate, drilled for floor anchors]**.
 - c. Post Cap: Nylon or plastic.
 - d. Unit Configuration: Configure shelving units as **[individual, freestanding][starter- and**

add-on unit] assemblies.

5. Framed-Type Wire Shelves: **[Steel][Metallic-coated-steel][Stainless steel]** wire-over-wire construction, with shelf frame fabricated from same material and with same finish as posts; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.
6. Truss-Type Wire Shelves: **[Steel][Metallic-coated-steel][Stainless steel][Manufacturer's standard, chrome-plated]** wire-over-wire construction, with downturned wire truss edges; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.
7. Waterfall-Type Wire Shelves: **[Steel][Metallic-coated-steel][Stainless steel]** wire-over-wire waterfall construction; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.
8. Shelf Quantity: **[Three][Four][Five][Six]<Insert number>** shelves per shelving unit in addition to top and bottom shelf.
9. Shelf-to-Post Connectors: Manufacturer's standard one-piece collet (wedge), designed to engage post collar attached to shelves.
10. Bracing: Manufacturer's standard diagonal cross bracing, as required for stability, load-carrying capacity of shelves, and number of shelves.
11. Overall Unit Width: **[24 inches (610 mm)][36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)]<Insert dimension>**, inclusive of two end posts.
12. Overall Unit Depth: **[12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]<Insert dimension>**.
13. Overall Unit Height: **[60 inches (1524 mm)][72 inches (1829 mm)][84 inches (2134 mm)]<Insert dimension>**.
14. Accessories:
 - a. Shelf Dividers: Fabricated from same material and with same finish as shelves; **[full-height][angle][tapered][sliding]<Insert description>** type.
 - b. Shelf Inlay: Manufacturer's standard **[clear plastic][static-dissipative plastic][hardboard]<Insert material>** mat.
 - c. Storage Basket: Edge-of-shelf-mounted wire basket, **<Insert dimensions>**; fabricated from same material and with same finish as shelves.
 - d. Back Ledges: **[1 inch (25 mm)][4 inches (102 mm)]<Insert dimension>** high, fabricated from same material and with same finish as shelves.
 - e. Side Ledges: **[1 inch (25 mm)][4 inches (102 mm)]<Insert dimension>** high, fabricated from same material and with same finish as shelves.
 - f. Garment Hanger Tube: Width of **[21 inches (533 mm)][shelves]<Insert dimension>**; with mounting brackets.
 - g. Shelf-Label Holders: **[Clear plastic][Colored plastic][Cold-rolled steel sheet]**, designed to clip onto front edge of shelf.
15. Steel Finish: **[Baked enamel or powder coat][Manufacturer's standard chrome plated]<Insert requirements>**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
16. Stainless Steel Finish: **[No. 4 directional-satin finish][Manufacturer's standard nondirectional-polish finish]**.

2.4 POST-AND-BEAM METAL STORAGE SHELVING

- A. Post-and-Beam Metal Shelving: Complying with MH 28.2; field-assembled from factory-formed components. Shelves are supported by beams that span between supporting corner posts that allow beam-height adjustment over full height of shelving unit. Provide fixed top and bottom beams,

adjustable intermediate beams, and accessories indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Borroughs Corporation]**
 - b. **[Edsal Manufacturing Company, Inc.]**
 - c. **[EQUIPTO]**
 - d. **[Interlake Mecalux]**
 - e. **[Lyon LLC]**
 - f. **[Penco Products, Inc.]**
 - g. **[Republic Storage Systems, LLC]**
 - h. **[Rousseau Metal Inc]**
 - i. **[Schaefer Systems International, Inc]**
 - j. **[Tennsco]**
 - k. **[UNICOR, Federal Prison Industries, Inc. (FPI)]**
 - l. **[Western Pacific Storage Systems]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Borroughs Corporation]**
 - b. **[Edsal Manufacturing Company, Inc.]**
 - c. **[EQUIPTO]**
 - d. **[Interlake Mecalux]**
 - e. **[Lyon LLC]**
 - f. **[Penco Products, Inc.]**
 - g. **[Republic Storage Systems, LLC]**
 - h. **[Rousseau Metal Inc]**
 - i. **[Schaefer Systems International, Inc]**
 - j. **[Tennsco]**
 - k. **[UNICOR, Federal Prison Industries, Inc. (FPI)]**
 - l. **[Western Pacific Storage Systems]**
 - m. **<Insert manufacturer's name>**
- B. Load-Carrying Capacity per Shelf: **[400 lb (181 kg)][1000 lb (454 kg)][2000 lb (907 kg)][As indicated on Drawings]<Insert load>**, uniformly distributed.
- C. Posts: Fabricated from cold-rolled steel; in **[manufacturer's standard][manufacturer's standard angle or open-box][1-1/2-by-1-1/2-inch (38-by-38-mm) angle][open-box]** shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive beam-to-post connectors.
1. Unit Configuration: Configure shelving units as **[individual, freestanding][starter- and add-on unit]** assemblies.
 2. Steel Thickness, Nominal: **[0.075 inch (1.90 mm)][As required for load-carrying capacity per shelf and number of shelves]<Insert thickness>**.
 - a. Add-On Shelf Posts: Fabricated from hot-rolled steel, T-shape; perforated to match main posts and of same thickness.
 3. Post Base: Cold-rolled steel floor plate, drilled for floor anchors.

- D. Beams: Fabricated from cold-rolled steel; in **[channel][flanged][channel or flanged][manufacturer's standard]** shape. Provide beam at each side of each shelf, with center supports as required for load-carrying capacity of shelf.
1. Steel Thickness, Nominal: **[0.075 inch (1.90 mm)][As required for load-carrying capacity per shelf]<Insert thickness>**.
 2. Beam-to-Post Connectors: Projecting **[rivet][tab][manufacturer's standard]** at each end that engage posts.
 - a. Top and Bottom Shelf Beams: Provide with **[single][double]** beam-to-post connectors.
 - b. Intermediate Shelf Beams: Provide with **[single][double]** beam-to-post connectors.
 3. Beam Quantity: **[As required for number of shelves indicated]<Insert number>** per shelving unit.
- E. Particleboard Shelves: **5/8 inch (16 mm)** thick; **[factory][or][field]** cut.
- F. Flat Metal Shelves: Fabricate **[fronts and backs][fronts, backs, and sides]** of shelves with box-formed edges, with corners lapped and welded from the following material:
1. Steel Sheet: Nominal thickness **[0.030 inch (0.76 mm)][0.036 inch (0.91 mm)][0.048 inch (1.21 mm)][as required for load-carrying capacity per shelf]<Insert thickness>**.
 2. Metallic-Coated Steel Sheet: Nominal Thickness **[0.034 inch (0.86 mm)][0.040 inch (1.02 mm)][0.052 inch (1.32 mm)][as required for load-carrying capacity per shelf]<Insert thickness>**.
- G. Ribbed-Metal-Decking Shelves: Fabricated from **[0.036-inch- (0.91-mm-)]<Insert thickness>** nominal thickness steel sheet.
- H. Wire Shelves: Welded steel wire; with **[2-by-4-inch (51-by-102-mm)][Manufacturer's standard]<Insert dimensions>** openings.
- I. Shelf Quantity: **[Three][Four][Five][Six]<Insert number>** shelves per shelving unit in addition to top and bottom shelf.
- J. Overall Unit Width: **[36 inches (914 mm)][48 inches (1219 mm)][60 inches (1524 mm)][69 inches (1753 mm)][72 inches (1829 mm)][96 inches (2438 mm)]<Insert dimension>**, inclusive of two end posts.
- K. Overall Unit Depth: **[18 inches (457 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert dimension>**.
- L. Overall Unit Height: **[60 inches (1524 mm)][72 inches (1829 mm)][84 inches (2134 mm)][96 inches (2438 mm)]<Insert dimension>**.
- M. Accessories:
1. Tie Plates: Cold-rolled steel, finished to match posts; designed for joining posts of adjacent shelving units.
 2. Supports: **[Back-to-wall][and][back-to-back]** type that bolt to posts; as required for shelving unit stability.
 3. Record Boxes: Knocked-down, corrugated fiberboard with white finish and contrasting contents legend; with prepunched handles and matching separate lid.
 - a. Letter/Legal-Size Boxes: **12-1/2 inches wide by 16 inches deep by 10-1/2 inches high (318 mm wide by 406 mm deep by 267 mm high)** for letter-size material stored left to

right and legal-size material stored front to back.

1) Quantity: **<Insert number>**.

b. Letter-Size Boxes: **12-1/2 inches wide by 24 inches deep by 10-1/2 inches high (318 mm wide by 610 mm deep by 267 mm high)** for letter-size material stored left to right.

1) Quantity: **<Insert number>**.

4. Record Box Support Rails: **1-1/2-by-1-1/2-inch (38-by-38-mm)** metal angle, with length to match depth of shelving unit; fabricated from same material and with same finish as beams.

N. Steel Finish: **[Baked enamel][or][powder coat]**.

1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.5 ANCHORS

A. Floor Anchors: Galvanized-steel, **[post-installed expansion anchors][power-actuated fasteners][or][threaded concrete screws]**. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.

B. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide **[one]<Insert number>** per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.6 FABRICATION

A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

B. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. **[Form backs of shelving units of up to 48 inches (1219 mm) wide from one piece.]**

C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a hem on the concealed side; ease edges of metal plate to radius of approximately **1/32 inch (0.8 mm)**. Shear and punch metals cleanly and accurately. Remove burrs.

D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so surface is smooth after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine **[walls][and][ceilings]** to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Install seismic restraints.
 - 6. Connect **[side-to-side][and][back-to-back]** shelving units together.
 - 7. Install shelves in each shelving unit at **[spacing indicated on Drawings][equal spacing]**.
 - a. Case-Type Metal Storage Shelving: Install adjustable shelf clips at front and back of each shelf.
 - b. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
 - c. Post-and-Beam Metal Storage Shelving: Install beams with beam-to-post connectors fully engaged in post perforations.
- B. Accessories:
 - 1. Install finished end panels and trim at exposed ends of shelving units.
 - 2. Shelf Dividers: Install **[at locations indicated on Drawings]<Insert requirements>**.
 - 3. Bins: Install **[at locations indicated on Drawings]<Insert requirements>**.
 - 4. Shelf-Label Holders: Install **[one]<Insert number>** on each shelf.
 - a. Install **[centered][vertically aligned][at locations indicated on Drawings]** within each shelving unit.
 - 5. Record Box Support Rails: Provide two for each record storage box.



6. Shelf Inlays: Install **[one per shelf][at locations indicated on Drawings]**.
7. Storage Baskets: Install **[at locations indicated on Drawings]<Insert requirements>**.
8. Back Ledges: Install **[one per shelf][at locations indicated on Drawings]**.
9. Side Ledges: Install **[on each side of each shelf][at locations indicated on Drawings]**.
10. Garment Hanger Tubes: Install **[at locations indicated on Drawings]<Insert requirements>**.

3.4 ERECTION TOLERANCES

- A. Erect **[case-type][and][four-post]** metal storage shelving to a maximum tolerance from vertical of **1/2 inch (13 mm)** in up to **10 ft. (3 m)** of height, not exceeding **1 inch (25 mm)** for heights taller than **10 ft. (3 m)**.
- B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of **1/4 inch (6 mm)** in **84 inches (2134 mm)** of height.

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13 00



Task	Specification	Specification Description
10 56 13 16	10 56 13 00	Metal Storage Shelving
10 71 13 13	01 11 19 00	No Specification Required



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SECTION 10 73 13 00 - AWNINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed awnings.
2. Manually operated retractable awnings.
3. Motorized retractable awnings.

B. Related Requirements:

1. Section 108316 "Banners" for ornamental fabrics for interior or exterior use.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for awnings.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting heights, and attachment details.
2. Detail fabrication and assembly of awnings[, **including seam layout, spacing, and orientation of awning fabric**].
3. Include diagrams for power, signal, and control wiring.
4. Show locations for blocking, reinforcement, and supplementary structural support.
5. Graphics: Show text message, font, character sizes, and other graphic forms; character, word, and line spacing; margin widths; position of copy; and other information related to graphic design.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For each type of exposed finish.

1. Include Samples of graphics[**on fabric**] and accessories involving color or finish selection.

E. Samples for Verification: For the following:

1. Awning Fabric: **12-inch- (300-mm-)** square section of fabric from dye lot to be used for the Work, with specified treatments applied. Mark face of fabric.
2. Graphics: Not less than **12-inch- (300-mm-)** square section showing graphics application method.
3. Seam, Edge, and Corner Condition: Not less than **12-inch- (300-mm-)** long section showing seam, edge, and corner treatment.
4. Valance: Full-size unit, not less than **12 inches (300 mm)** long.

10 - Specialties

5. Frame Finish: Not less than **6-inch (150-mm)** lengths.

F. Product Schedule: For awnings. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For awnings to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 WARRANTY

A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of awnings that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including framework.
- b. Deterioration of fabric including seam failure.
- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- d. Faulty operation of operator.

2. Awning Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

3. Fabric Warranty Period: **[Three][Five][Eight][12]<Insert number>** years from date of Substantial Completion.

4. Thread Warranty Period: **[Five][Eight]<Insert number>** years from date of Substantial Completion.

5. Graphics Warranty Period: Outdoor durability not less than **[five][three]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>**.
- B. Fire-Test-Response Characteristics: Provide awning fabrics with the fire-test-response characteristics indicated, as determined by testing identical products according to test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes **[NFPA 701][California Code of Regulations, Title 19]**.
 - 2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency for Flame-Spread Index of **[25]<Insert value>** or less.
 - 3. Permanently attach label to each awning fabric indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

2.2 FABRIC

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **<Insert manufacturer's name>**
- C. Fabric:
 - 1. Fiber Content: **[Vinyl-laminated or -coated polyester mesh][Vinyl-laminated or -coated polyester][Acrylic-coated polyester][Resin-coated polyester][Vinyl-coated polyester/cotton blend][Acrylic-coated polyester/cotton blend][Resin-coated polyester/cotton blend][Solution-dyed acrylic][Solution-dyed modacrylic][Expanded PTFE]<Insert description>**.
 - 2. Weight: **<Insert value>**.
 - 3. Width: **<Insert dimension>**.
 - 4. Solar-Optical Properties: **<Insert requirements>**.
 - 5. Openness Factor: **<Insert number>** percent.
 - 6. UV-Light Blockage: **<Insert number>** percent.
 - 7. Mildew Resistance: Showing no growth when tested according to ASTM G21.
 - 8. Shrinkage: Not greater than **[0.1][0.5][1]<Insert number>** percent according to ASTM D1204.
 - 9. Stretch Factor: Not less than **[0.4][1][4]<Insert number>** percent according to ASTM D4851.
 - 10. Applied Treatment: **[Stain resistant][Mildew resistant][Polymer, flame resistant][Water repellent][Lamination]<Insert description>**.
 - 11. Pattern and Color: **[Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated in an awning schedule]<Insert color>**.
- D. Seam Thread: **[100 percent expanded PTFE][100 percent bonded polyester]**, UV-light, mildew, and

rot resistant.

- E. Decorative Trims: **[Borders][Braid and bindings][Cords][Fringe][Patterned edge; scalloped][Patterned edge; V-shaped][Streamers][Tassels][Welting]<Insert description>**.
 - 1. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][Matching or coordinating with awning fabric color][As selected by Architect from manufacturer's full range][As indicated in an awning schedule]<Insert colors>**.
- F. Fringe: **[As indicated by manufacturer's designation for style and color][As indicated in awning schedule]<Insert description>**.

2.3 AWNING FRAME AND ACCESSORY MATERIALS

- A. Steel:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Steel Tubing: ASTM A500/A500M.
 - 3. Galvanized Steel Tubing: ASTM A787/A787M.
 - 4. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40).
- B. Aluminum: Alloy and temper recommended by awning manufacturer for type of use and finish indicated and with not less than the strength and durability properties of alloy and temper required by structural loads.
 - 1. Aluminum Plate and Sheet: **ASTM B209 (ASTM B209M)**.
 - 2. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**.
 - 3. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, standard weight (Schedule 40).
 - 4. Drawn Seamless Tubing: **ASTM B210 (ASTM B210M)**.
- C. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, **[tamperproof, vandal- and theft-resistant]**, compatible, nonstaining materials. Provide as required for awning assembly, mounting, and secure attachment. Number as needed to comply with performance requirements and to maintain uniform appearance; evenly spaced. Where exposed to view, provide finish and color as selected by Architect from manufacturer's full range.
 - 1. Wood Screws: ASME B18.6.1.
 - 2. Lag Bolts: **ASME B18.2.1 (ASME B18.2.3.8M)**.
 - 3. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, **Grade A325 (Grade A325M)**, Type 1, heavy-hex steel structural bolts; **ASTM A563, Grade DH, (ASTM A563M, Class 10S)** heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers, zinc coated.
 - 4. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E488 conducted by a qualified independent testing and inspecting agency.
 - a. Material: Stainless steel with bolts and nuts complying with **ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4)**.
 - 5. Adhesive-Bonded Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and

equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E1512 conducted by a qualified independent testing and inspecting agency.

- a. Material: Stainless steel with bolts and nuts complying with **ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4)**.
6. Grommets: **[Zinc-coated brass, No. 2][Stainless steel, No. 2]<Insert description>**.
7. Lacing: **[100 percent polyester, braided No. 4]<Insert description>**.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.4 AWNING FABRIC FABRICATION

- A. Fabrication: Reinforce wear points and hardware attachment points with **[nonwoven][mesh][polypropylene mesh]<Insert description>** webbing. Seam fabrics **[in locations indicated on the Drawings and]** as follows:
 1. Fabric Edges and Seams:
 - a. Fold and stitch selvedge and cut fabric edges.
 - b. Hot cut and sealed.
 - c. Radio-frequency welded.
 - d. Adhesively bonded.
 - e. Manufacturer's standard hemming and seaming methods.
 2. Fabric Attachment:
 - a. **[Manufacturer's standard][Hem pockets][Screws][Staples]**.
 - b. Grommets.
 - 1) Grommet Spacing: **[6 inches (150 mm) o.c.]<Insert spacing>**.
- B. Fabric Insets: **[Heat-sealed][Sewn-in]** process.
- C. Graphic Application: **[Hand painting][Silk-screen printing][Heat color transfer][Vinyl film with pressure-sensitive adhesive backing][PVDF film with pressure-sensitive adhesive backing][PVF film with pressure-sensitive adhesive backing][Radio-frequency, heat-sealed vinyl film][Eradication][Cut-out lettering]<Insert description>**.
 1. Graphic Image: **[As indicated on Drawings][As indicated in awning schedule]**.
 2. Text Message: **[As indicated on Drawings][As indicated in an awning schedule]<Insert text>**.
 - a. Text Font: **[Arial]<Insert style>**.
 - b. Character Size: Minimum **[1-inch- (25.4-mm-)][1-foot- (0.3048-m-)]<Insert dimension>** high characters.
 - c. Character Colors: **<Insert colors>**.
 3. Vinyl Film: **[Calendered-vinyl film, not less than 3 mils (0.076 mm) thick, with pressure-sensitive adhesive backing][Cast-vinyl film, not less than 2 mils (0.051 mm) thick, with pressure-sensitive adhesive backing][Cast-vinyl reflective film, not less than 2 mils (0.051**

mm) thick, with pressure-sensitive adhesive backing]<Insert description>.

2.5 FIXED AWNINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **<Insert manufacturer's name>**
- C. Steel Finish: **[Galvanized mill finish; apply galvanizing repair paint to welds.][Manufacturer's standard primed and top-coated decorative][Baked-enamel or powder-coat]<Insert finish>** finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- D. Aluminum Finish: **[Mill][Manufacturer's standard primed and top-coated decorative][Baked-enamel or powder-coat]<Insert finish>** finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.6 MANUALLY OPERATED RETRACTABLE AWNINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **<Insert manufacturer's name>**
- C. Type: Retractable awning, fabricated form aluminum, with hinged arms attached to **[steel]** torsion bar with tensioning system designed to keep fabric taut in any position.
- D. Fabric Roll Protection: **[Cassette design to fully enclose][Semi-cassette design to partially enclose][Sheet metal hood to protect]** fabric roll when awning is retracted.
- E. Manual Operator: Provide gear and crank operator.
 - 1. Manual Operator Assist Mechanism: Manufacturer's standard spring assist for operating heavy

- awnings.
 2. Crank Handle: **[One][Two]<Insert number>**, detachable.
 3. Awning Coupler System: Designed for simultaneously operating multiple awnings with a single crank. Provide system **[for each group of awnings][where indicated on Drawings][where indicated in an awning schedule]**.
 4. Operating Function: **[Stop and hold awning at any position in ascending or descending travel][Stop and hold awning at fully open or fully closed positions only]<Insert requirement>**.
- F. Mounting Brackets: Configured for mounting to surface indicated, with adjustable pitch.
- G. Finish: **[Manufacturer's standard primed and top-coated decorative][Baked-enamel or powder-coat]<Insert finish>** finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.7 MOTORIZED RETRACTABLE AWNINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Eclipse Shading Systems]**
 2. **[Markilux USA]**
 3. **[Somfy Systems Inc.]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Eclipse Shading Systems]**
 2. **[Markilux USA]**
 3. **[Somfy Systems Inc.]**
 4. **<Insert manufacturer's name>**
- C. Type: Retractable awning, fabricated form aluminum, with hinged arms attached to **[steel]** torsion bar, with tensioning system designed to keep fabric taut in any position.
- D. Fabric Roll Protection: **[Cassette design to fully enclose][Semi-cassette design to partially enclose][Sheet metal hood to protect]** fabric roll when awning is retracted.
- E. Motorized Operator: Provide factory-assembled, motorized, retractable-awning operator designed for retracting awnings of type, size, weight, construction, use, and operation frequency indicated.
- F. Mounting Brackets: Configured for mounting to surface indicated, with adjustable pitch.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6[**with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc**].
- I. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA

MG 1, with thermal-overload protection and internal limit switches; sized by awning manufacturer to start and operate size and weight of awning considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1 unless otherwise indicated.
2. Motor Characteristics: Single phase, **[24][110][220]<Insert value> V**, 60 Hz.
3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
4. Motor Mounting: Within manufacturer's standard roller enclosure.

J. Remote Controls: Electric controls with NEMA ICS 6, **[Type 1][Type 4]<Insert type>** enclosure for **[surface][recessed or flush]<Insert description>** mounting. Provide the following devices for remote-control activation of awnings:

1. Keyed Control Stations: **[Maintained][Momentary]**-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
2. Control Stations: **[Maintained][Momentary]**-contact, three-position, **[toggle][rocker]**-style, wall-switch-operated control station with open, close, and center-off functions.
 - a. Function: **[Individual][Group][Combined individual and group]**.
 - b. Color: **[Ivory][White][As indicated in an awning schedule]**.
3. Sun Sensor Controls: Programmable system activated by LEDs detecting daylight intensity and responding by automatically adjusting awnings.
4. Radio Controls: Digital system consisting of code-compatible universal coaxial receiver, **[one per awning][where indicated on Drawings]**.
 - a. Single Channel Radio Transmitters: Portable single-channel transmitters for operating a single motor with a single button to open and retract awning; provide **[two]<Insert number>** units.
 - b. Multi-Channel Radio Transmitters: Portable multi-channel transmitters for operating **[two][four][up to 12]<Insert number>** awnings individually, each with a single button to open and close awnings; provide **[two]<Insert number>** units.
5. Timer Controls: Clock timer, **[24-hour][seven-day]<Insert time period>** programmable for regular events.
6. Microprocessor Controls: Electronic programmable means for setting, changing, and adjusting control features. Provide unit isolated from voltage spikes and surges.

K. Operating Features: Include the following:

1. Capable of accepting input from building automation control system.
2. Override switch.
3. Backup gear and crank operator for manual operation during power failures with detachable handle, **[6 feet (1.8 m) long][manufacturer's standard length][length required to make operation convenient from ground level][length as indicated on Drawings]**.
4. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop awning at fully raised and fully lowered positions.
5. Preset Position Function: **[Stop and hold awning at any position][Stop and hold awning at three predetermined positions including open, closed, and one user-programmed position]<Insert operating mode>**.

L. Finish: **[Manufacturer's standard primed and top-coated decorative][Baked-enamel or powder-coat]<Insert finish>** finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, **[operational clearances, accurate locations of connections to building electrical system,][lighting,]** and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install awnings[**and motor controls**] at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.
- B. Install awnings after other finishing operations, including joint sealing and painting, have been completed.
- C. Slip fit frame connections accurately together to form hairline joints, and tighten to secure.
- D. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 1. Field Welding: Comply with the following requirements:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- G. Coordinate awning installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

10 - Specialties

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by retractable-awning manufacturer.

3.4 CLEANING AND PROTECTION

- A. Touch up factory-applied finishes to restore damaged or soiled areas.
- B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.5 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain retractable awnings.

END OF SECTION 10 73 13 00



Task	Specification	Specification Description
10 73 13 13	10 73 13 00	Awnings
10 73 13 23	10 73 13 00	Awnings
10 73 26 13	01 11 19 00	No Specification Required



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SECTION 10 75 16 00 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum flagpole.
2. Copper-alloy (bronze) flagpole.
3. Stainless steel flagpole.
4. Steel flagpole.
5. Fiberglass flagpole.

B. Products Installed, but Not Furnished, under This Section:

1. Flag(s); furnished by Owner.

C. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete" for concrete footings for flagpole.
2. Section 264113 "Lightning Protection for Structures" for connecting metal flagpole to lightning protection system.

1.2 ACTION SUBMITTALS

A. Product Data: For each specified system and assembly, including components and accessories.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpole.

B. Shop Drawings: Include plans, elevations, and attachment details. Show general arrangement, fittings, accessories, grounding, anchoring, and support details.

C. Samples for Initial Selection: Manufacturer's standard color charts, showing full range of available colors for each type of exposed finish.

D. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

E. Delegated Design Submittals: For flagpoles, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles.

1.4 QUALITY ASSURANCE

A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in



[state]<Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with heavy paper and enclose in a hard fiber tube or other protective container.
- B. Unload, store, and erect flagpole in a manner to prevent bending and surface damage.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of flagpole and accessories in accordance with manufacturers' written installation instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain flagpole as complete unit, including fittings and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Flagpole assemblies to withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirement> .
- B. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads within limits and under conditions indicated.
 - 1. Wind Loads: Determine in accordance with NAAMM FP 1001. Basic wind speed for Project location as indicated on Drawings.
 - 2. Base flagpole design on [polyester][nylon or cotton] flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 GROUND-SET FLAGPOLES

- A. Aluminum Flagpole: Fabricated from extruded tubing complying with ASTM B221 (ASTM B221M), Alloy 6063, minimum wall thickness of **3/16 inch (4.8 mm)**, without visible seam.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Acme Lingo Flagpoles]
 - b. [Concord American Flagpole]
 - c. [Eder Flag Manufacturing Company, Inc]
 - d. [Ewing Flagpole Co., Inc.; Ewing Group Company]

- e. **[Liberty Flagpoles]**
 - f. **[Morgan-Francis Flagpoles and Accessories]**
 - g. **[Pole-Tech Co., Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Acme Lingo Flagpoles]**
 - b. **[Concord American Flagpole]**
 - c. **[Eder Flag Manufacturing Company, Inc]**
 - d. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**
 - e. **[Liberty Flagpoles]**
 - f. **[Morgan-Francis Flagpoles and Accessories]**
 - g. **[Pole-Tech Co., Inc.]**
 - h. **<Insert manufacturer's name>**
3. Shape: **[Cone][Entasis]** tapered.
4. Exposed Height: **[20 ft. (6 m)][25 ft. (7.5 m)][30 ft. (9 m)][35 ft. (11 m)][40 ft. (12 m)][45 ft. (13.5 m)][50 ft. (15 m)][60 ft. (18 m)][70 ft. (21 m)][80 ft. (24 m)]<Insert dimension>** .
5. Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
- a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
6. Natural Satin Finish: **[AA-M32, fine, directional, medium satin polish][AA-M20, buff finish]** ; seal aluminum surfaces with clear, hard-coat wax.
7. Clear Anodic Finish: AAMA 611, **[AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm]** .
8. Color Anodic Finish: AAMA 611, **[AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm]** .
- a. Color: **[Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
9. Gold Anodic Finish: AAMA 611, AA-M32C22A43, Class I, 0.018 mm; gold color.
10. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>** .
11. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with **[AAMA 2604][AAMA 2605]** and containing not less than **[50][70]** percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>** .



12. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, **0.060-inch (1.52-mm)** wall thickness with **3/16-inch (4.8-mm)** steel bottom plate and support plate; **3/4-inch (19-mm-)** diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - a. Flashing Collar: Same material and finish as flagpole.
13. Foundation Sleeve: **[Fiberglass][or][PVC pipe]** foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - a. Flashing Collar: Same material and finish as flagpole.
14. Cast-Metal Shoe Base: Made from aluminum **[with same finish and color as flagpoles]<Insert finish and color>** for anchor-bolt mounting; furnish with anchor bolts.
 - a. Furnish ground spike.
15. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.
 - a. Finish: Same as flagpole.
 - b. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
 - c. Furnish ground spike.
16. Pivoting Tilt Base: Steel baseplate with channel or rectangular tube uprights, pivot bolt, and locking device for tilting flagpole. Furnish tilting flagpole with steel counterweight box and weights, or furnish with internal counterweight. Furnish base with anchor bolts.
 - a. Finish: Same as flagpole.
 - b. Furnish ground spike.
- B. Copper-Alloy (Bronze) Flagpole: Fabricated from seamless pipe or tube complying with ASTM B43 or ASTM B135/B135M, Alloy UNS C23000 (red brass, 85 percent copper).
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Acme Lingo Flagpoles]**
 - b. **[Eder Flag Manufacturing Company, Inc]**
 - c. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**
 - d. **[Pole-Tech Co., Inc.]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acme Lingo Flagpoles]**
 - b. **[Eder Flag Manufacturing Company, Inc]**
 - c. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**
 - d. **[Pole-Tech Co., Inc.]**

- e. <Insert manufacturer's name>
3. Shape: **[Cone][Entasis]** tapered.
 4. Exposed Height: **[20 ft. (6 m)][25 ft. (7.5 m)][30 ft. (9 m)][35 ft. (11 m)][40 ft. (12 m)][45 ft. (13.5 m)][50 ft. (15 m)][60 ft. (18 m)][70 ft. (21 m)][80 ft. (24 m)]<Insert dimension>** .
 5. Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
 - a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 6. Hand-Rubbed Finish, Lacquered: Directionally textured, fine satin, mechanical finish coated with lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of **1 mil (0.025 mm)**.
 7. Statuary Conversion Coating over Satin Finish: Directionally textured, fine satin, mechanical finish with sulfide conversion coating.
 - a. Color: Match Architect's sample.
 - b. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
 8. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, **0.060-inch (1.52-mm)** wall thickness with **3/16-inch (4.8-mm)** steel bottom plate and support plate; **3/4-inch (19-mm)** diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - a. Flashing Collar: Same material and finish as flagpole.
 9. Cast-Metal Shoe Base: Made from steel **[with finish matching flagpole]<Insert finish and color>** for anchor-bolt mounting; furnish with anchor bolts.
 - a. Furnish ground spike.
- C. Stainless Steel Flagpole: Fabricated from pipe, tube, or plate complying with ASTM A312/A312M, ASTM A269/A269M, or ASTM A666/A666M **[Type 304][Type 316L]** .
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Acme Lingo Flagpoles]**
 - b. **[Eder Flag Manufacturing Company, Inc]**
 - c. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**
 - d. **[Pole-Tech Co., Inc.]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acme Lingo Flagpoles]**
 - b. **[Eder Flag Manufacturing Company, Inc]**
 - c. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**

- d. [Pole-Tech Co., Inc.]
 - e. <Insert manufacturer's name>
3. Shape: [Cone][Entasis] tapered.
 4. Exposed Height: [20 ft. (6 m)][25 ft. (7.5 m)][30 ft. (9 m)][35 ft. (11 m)][40 ft. (12 m)][45 ft. (13.5 m)][50 ft. (15 m)][60 ft. (18 m)][70 ft. (21 m)][80 ft. (24 m)]<Insert dimension> .
 5. Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
 - a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 6. Stainless Steel Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Brushed Finish: ASTM A480/A480M No. 4.
 - d. Mirror Polish Finish: ASTM A480/A480M No. 8.
 7. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, **0.060-inch (1.52-mm)** wall thickness with **3/16-inch (4.8-mm)** steel bottom plate and support plate; **3/4-inch (19-mm)** diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - a. Flashing Collar: Same material and finish as flagpole.
 8. Cast-Metal Shoe Base: Made from steel **[with finish matching flagpole]**<Insert finish and color> for anchor-bolt mounting; furnish with anchor bolts.
 - a. Furnish ground spike.
- D. Steel Flagpole: Fabricated from standard-weight, seamless steel pipe complying with ASTM A53/A53M, Type S, Grade B, or steel tube complying with ASTM A513/A513M.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [Acme Lingo Flagpoles]
 - b. [Eder Flag Manufacturing Company, Inc]
 - c. [Ewing Flagpole Co., Inc.; Ewing Group Company]
 - d. [Pole-Tech Co., Inc.]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Acme Lingo Flagpoles]
 - b. [Eder Flag Manufacturing Company, Inc]
 - c. [Ewing Flagpole Co., Inc.; Ewing Group Company]

- d. **[Pole-Tech Co., Inc.]**
 - e. **<Insert manufacturer's name>**
 3. Shape: **[Cone tapered][Stepped sectional]** .
 4. Exposed Height: **[20 ft. (6 m)][25 ft. (7.5 m)][30 ft. (9 m)][35 ft. (11 m)][40 ft. (12 m)][45 ft. (13.5 m)][50 ft. (15 m)][60 ft. (18 m)][70 ft. (21 m)][80 ft. (24 m)]<Insert dimension>** .
 5. Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
 - a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 - c. Provide self-aligning, snug-fitting joints.
 6. Flagpole Interior Finish: Apply one coat of bituminous paint on interior of flagpole.
 7. Galvanized Finish: Hot-dip galvanize after fabrication to comply with ASTM A123/A123M.
 8. Polyurethane Enamel Finish: Remove mill scale and rust, if present, from uncoated steel, complying with NACE No. 1/SSPC-SP 5, "White Metal Blast Cleaning" **<Insert surface preparation method>** . After cleaning, apply manufacturer's standard primer and two-coat, high-gloss, high-build, polyurethane-enamel finish.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
 9. Baked-Enamel or Powder-Coat Finish: Remove mill scale and rust, if present, from uncoated steel, complying with **[NACE No. 1/SSPC-SP, "White Metal Blast Cleaning"]<Insert surface preparation method>** . After cleaning, apply a conversion coating suited to the organic coating to be applied over it. After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>** .
 10. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, **0.060-inch (1.52-mm)** wall thickness with **3/16-inch (4.8-mm)** steel bottom plate and support plate; **3/4-inch (19-mm)** diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - a. Flashing Collar: Same material and finish as flagpole.
 - b. Furnish steel ground protectors extending **12 inches (300 mm)** aboveground and **6 inches (150 mm)** belowground for steel flagpoles where flashing collars are not provided.
 11. Cast-Metal Shoe Base: Made from steel **[with finish matching flagpole]<Insert finish and color>** for anchor-bolt mounting; furnish with anchor bolts.
 - a. Furnish ground spike.
- E. Fiberglass Flagpole: flagpole fabricated from polyester resin reinforced with woven glass-fiber roving with 75 percent of glass fibers parallel to length of flagpole.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :



- a. **[Flagmore]**
 - b. **[Liberty Flagpoles]**
 - c. **[PLP Composite Technologies, Inc.]**
 - d. **[Pole-Tech Co., Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flagmore]**
 - b. **[Liberty Flagpoles]**
 - c. **[PLP Composite Technologies, Inc.]**
 - d. **[Pole-Tech Co., Inc.]**
 - e. **<Insert manufacturer's name>**
3. Shape: **[Cone][Entasis]** tapered.
4. Exposed Height: **[20 ft. (6 m)][25 ft. (7.5 m)][30 ft. (9 m)][35 ft. (11 m)][40 ft. (12 m)][45 ft. (13.5 m)][50 ft. (15 m)][60 ft. (18 m)][70 ft. (21 m)][80 ft. (24 m)]<Insert dimension>** .
5. Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
 - a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
6. Fiberglass Finish: Manufacturer's standard UV-light stable, hard, high-gloss gel coat or high-gloss, high-build polyurethane or polyester coating.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>** .
7. Sleeve for Fiberglass Flagpole: **[Fiberglass][or][PVC pipe]** foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - a. Flashing Collar: Same material and finish as flagpole.
8. Cast-Metal Shoe Base: Made from aluminum **[with finish matching flagpole]<Insert finish and color>** for anchor-bolt mounting; furnish with anchor bolts.
 - a. Furnish ground spike.
9. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.
 - a. Finish: Same as flagpole.
 - b. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
 - c. Furnish ground spike.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. **0.063-inch (1.6-mm)** spun aluminum [, **finished to match flagpole**][**with gold anodic finish**] .
 2. **20-oz. (0.70-mm)** copper with 23-karat, gold-leaf finish.
 3. Spun stainless steel, finished to match flagpole.
 4. Spun copper alloy, finished to match flagpole.
- B. Finial Eagle: Sized [**as indicated**][**as standard with manufacturer for flagpole size indicated**]**<Insert size>** .
1. Cast aluminum [, **finished to match flagpole**][**with gold anodic finish**] .
 2. **20-oz. (0.70-mm)** copper with 23-karat, gold-leaf finish.
- C. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
1. Halyard Flag Snaps: [**Chromium-plated bronze**][**Stainless steel**][**Bronze**][**Nylon**] swivel snap hooks [**with neoprene or vinyl covers**] . Furnish two per halyard.
 2. Plastic Halyard Flag Clasps for Internal Halyard, Winch System: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clasps attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.
- D. Internal Halyard, Cam Cleat System: [**5/16-inch (8-mm) diameter, braided polypropylene**]**<Insert type>** halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
1. Halyard Flag Snaps: [**Chromium-plated bronze**][**Stainless steel**][**Bronze**][**Nylon**] swivel snap hooks [**with neoprene or vinyl covers**] . Furnish two per halyard.
 2. Plastic Halyard Flag Clasps for Internal Halyard, Cam Cleat System: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clasps attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.
- E. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous [**5/16-inch (8-mm) diameter, braided polypropylene halyard**]**<Insert type>** and **9 inches (228-mm)** cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
1. Halyards and Cleats: [**One**][**Two**] at each flagpole.
 2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
 3. Halyard Covers: **2 inches (50-mm)** channel, **60 inches (1500 mm)** long, finished to match flagpole.
 4. Halyard Flag Snaps: [**Chromium-plated bronze**][**Stainless steel**][**Bronze**][**Nylon**] swivel snap hooks [**with neoprene or vinyl covers**] . Furnish two per halyard.
 5. Plastic Halyard Flag Clasps for External Halyard, Ball-Bearing System: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clasps attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C33/C33M, fine aggregate.



- D. Elastomeric Joint Sealant: **[Multicomponent nonsag urethane][Single-component nonsag urethane][Single-component neutral-curing silicone]** joint sealant complying with requirements in Section 079200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concrete placement.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves in forms by bracing to concrete reinforcement and forms.
- F. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to concrete reinforcement steel.
- G. Place concrete as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.
- H. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 INSTALLATION OF GROUND-SET FLAGPOLES

- A. General: Install flagpoles where indicated on Drawings and in accordance with approved Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a **2-inch (50-mm)** layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.



END OF SECTION 10 75 16 00



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SECTION 10 75 23 00 - WALL-MOUNTED FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wall-mounted flagpoles made from **[aluminum][copper alloy (bronze)][stainless steel][and][fiberglass]**.
- B. Owner-Furnished Material: Flags.
- C. Related Requirements:
 - 1. Section 264113 "Lightning Protection for Structures" for connecting wall-mounted metal flagpoles to lightning protection system.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
 - 1. Include plans, elevations, and details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 2. Include details of wall-mounted connections and mountings.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.
- D. Delegated-Design Submittal: For flagpoles.
 - 1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of anchorages for flagpoles. Furnish setting drawings, templates, and directions for installing anchorages that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.



PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is **<Insert wind speed>**.
 - 2. Base flagpole design on **[polyester][nylon or cotton]** flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: **[Cone][Entasis]**-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of **3/16 inch (4.8 mm)**.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acme Lingo Flagpoles]**
 - b. **[American Flagpole]**
 - c. **[Baartol Company]**
 - d. **[Concord American Flagpole]**
 - e. **[Eder Flag Manufacturing Company, Inc]**
 - f. **[Ewing Flagpole Co., Inc.; Ewing Group Company]**
 - g. **[Morgan-Francis Flagpoles and Accessories]**
 - h. **[Pole-Tech Co., Inc.]**
 - i. **[US Flag & Flagpole Supply, LLC]**
 - j. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acme Lingo Flagpoles]**
 - b. **[American Flagpole]**
 - c. **[Baartol Company]**

- d. [Concord American Flagpole]
 - e. [Eder Flag Manufacturing Company, Inc]
 - f. [Ewing Flagpole Co., Inc.; Ewing Group Company]
 - g. [Morgan-Francis Flagpoles and Accessories]
 - h. [Pole-Tech Co., Inc.]
 - i. [US Flag & Flagpole Supply, LLC]
 - j. <Insert manufacturer's name>
- B. Exposed Length: [8 feet (2.5 m)][10 feet (3 m)][12 feet (3.7 m)][15 feet (4.6 m)][20 feet (6 m)][25 feet (7.5 m)][30 feet (9 m)]<Insert dimension>.
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
- 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Vertical Wall Mount: Cast-aluminum mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
- 1. Finish: [Same as flagpole][Gold anodic][Bronze powder coated][Black powder coated].
- E. Outrigger Wall Mount: Aluminum mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
- 1. Finish: [Same as flagpole][Gold anodic][Bronze powder coated][Black powder coated].
- 2.4 COPPER-ALLOY (BRONZE) FLAGPOLES
- A. Copper-Alloy (Bronze) Flagpoles: [Cone][Entasis]-tapered flagpoles fabricated from seamless pipe or tube complying with ASTM B43 or **ASTM B135 (ASTM B135M)**, Alloy UNS C23000 (red brass, 85 percent copper).
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Acme Lingo Flagpoles]
 - b. [Baartol Company]
 - c. [Ewing Flagpole Co., Inc.; Ewing Group Company]
 - d. [Pole-Tech Co., Inc.]
 - e. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Acme Lingo Flagpoles]
 - b. [Baartol Company]
 - c. [Ewing Flagpole Co., Inc.; Ewing Group Company]
 - d. [Pole-Tech Co., Inc.]
 - e. <Insert manufacturer's name>
- B. Exposed Length: [20 feet (6 m)][25 feet (7.5 m)][30 feet (9 m)][35 feet (11 m)][40 feet (12 m)]<Insert



dimension>.

- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Vertical Wall Mount: Cast-copper-alloy (bronze) mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
 - 1. Finish: Same as flagpole.
- E. Outrigger Wall Mount: Copper-alloy (bronze) mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
 - 1. Finish: Same as flagpole.

2.5 STAINLESS-STEEL FLAGPOLES

- A. Stainless-Steel Flagpoles: [**Cone**][**Entasis**]-tapered flagpoles fabricated from pipe, tube, or plate complying with ASTM A312/A312M, ASTM A269, or ASTM A666, [**Type 304**][**Type 316L**].
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [**Acme Lingo Flagpoles**]
 - b. [**Baartol Company**]
 - c. [**Ewing Flagpole Co., Inc.; Ewing Group Company**]
 - d. [**Pole-Tech Co., Inc.**]
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [**Acme Lingo Flagpoles**]
 - b. [**Baartol Company**]
 - c. [**Ewing Flagpole Co., Inc.; Ewing Group Company**]
 - d. [**Pole-Tech Co., Inc.**]
 - e. **<Insert manufacturer's name>**
- B. Exposed Length: [**20 feet (6 m)**][**25 feet (7.5 m)**][**30 feet (9 m)**][**35 feet (11 m)**][**40 feet (12 m)**]**<Insert dimension>.**
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

- D. Vertical Wall Mount: Cast-aluminum mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
 - 1. Finish: [**Clear anodic**][**Gold anodic**][**Bronze powder-coated**][**Black powder-coated**][**Silver powder-coated**].
- E. Outrigger Wall Mount: Aluminum mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
 - 1. Finish: [**Clear anodic**][**Gold anodic**][**Bronze powder-coated**][**Black powder-coated**][**Silver powder-coated**].

2.6 FIBERGLASS FLAGPOLES

- A. Fiberglass Flagpoles: [**Cone**][**Entasis**]-tapered flagpoles fabricated from polyester resin reinforced with woven glass-fiber roving with 75 percent of glass fibers parallel to length of flagpole.
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [**Atlantic Fiberglass Products, Inc.**]
 - b. [**Eder Flag Manufacturing Company, Inc**]
 - c. [**Ewing Flagpole Co., Inc.; Ewing Group Company**]
 - d. [**PLP Composite Technologies, Inc**]
 - e. [**Pole-Tech Co., Inc.**]
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [**Atlantic Fiberglass Products, Inc.**]
 - b. [**Eder Flag Manufacturing Company, Inc**]
 - c. [**Ewing Flagpole Co., Inc.; Ewing Group Company**]
 - d. [**PLP Composite Technologies, Inc**]
 - e. [**Pole-Tech Co., Inc.**]
 - f. **<Insert manufacturer's name>**
- B. Exposed Length: [**20 feet (6 m)**][**25 feet (7.5 m)**][**30 feet (9 m)**][**35 feet (11 m)**][**40 feet (12 m)**]**<Insert dimension>**.
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Vertical Wall Mount: Cast-aluminum mounting bracket complete with[**escutcheon,**] mounting plate and through-wall anchorage.
 - 1. Finish: [**Matching flagpole**][**Gold anodic**][**Bronze powder-coated**][**Black powder-coated**].
- E. Outrigger Wall Mount: Aluminum mounting bracket complete with[**escutcheon,**] mounting plate and

through-wall anchorage.

1. Finish: **[Matching flagpole][Gold anodic][Bronze powder-coated][Black powder-coated]**.

2.7 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 1. **0.063-inch (1.6-mm)** spun aluminum[, **finished to match flagpole**][**with gold anodic finish**].
 2. **20-oz. (0.70-mm)** copper with 23-karat gold-leaf finish.
 3. Spun stainless steel, finished to match flagpole.
 4. Spun copper alloy, finished to match flagpole.
- B. Finial Eagle: Sized **[as indicated][as standard with manufacturer for flagpole size indicated]<Insert size>**.
 1. Cast aluminum[, **finished to match flagpole**][**with gold anodic finish**].
 2. **20-oz. (0.70-mm)** copper with 23-karat gold-leaf finish.
- C. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 1. Halyard Flag Snaps for Internal Halyard, Winch System: **[Chromium-plated bronze][Stainless steel][Bronze][Nylon]** swivel snap hooks[**with neoprene or vinyl covers**]. Furnish two per halyard.
 2. Plastic Halyard Flag Clips for Internal Halyard, Winch System: Made from injection-molded, UV-stabilized acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Acme Lingo Flagpoles]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Acme Lingo Flagpoles]**
 - 2) **<Insert manufacturer's name>**
- D. Internal Halyard, Cam Cleat System: **[5/16-inch- (8-mm-) diameter, braided polypropylene]<Insert type>** halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 1. Halyard Flag Snaps for Internal Halyard, Cam Cleat System: **[Chromium-plated bronze][Stainless-steel][Bronze][Nylon]** swivel snap hooks[**with neoprene or vinyl covers**]. Furnish two per halyard.
 2. Plastic Halyard Flag Clips for Internal Halyard, Cam Cleat System: Made from injection-molded,

UV-stabilized acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) **[Acme Lingo Flagpoles]**
- 2) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Acme Lingo Flagpoles]**
- 2) **<Insert manufacturer's name>**

- E. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous **[5/16-inch- (8-mm-) diameter, braided polypropylene halyard]<Insert type>** and **9-inch (228-mm)** cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Halyards and Cleats: **[One][Two]** at each flagpole.
2. Halyard Flag Snaps for External Halyard, Ball-Bearing System: **[Chromium-plated bronze][Stainless-steel][Bronze][Nylon]** swivel snap hooks **[with neoprene or vinyl covers]**. Furnish two per halyard.
3. Plastic Halyard Flag Clips for External Halyard, Ball-Bearing System: Made from injection-molded, UV-stabilized acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) **[Acme Lingo Flagpoles]**
- 2) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Acme Lingo Flagpoles]**
- 2) **<Insert manufacturer's name>**

2.8 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. Clear Anodic Finish: AAMA 611, **[AA-M12C22A41][AA-M12C22A31]**.
- C. Color Anodic Finish: AAMA 611, **[AA-M12C22A42/A44][AA-M12C22A32/A34]**.
1. Color:

- a. [Light bronze][Medium bronze][Dark bronze][Black]<Insert color>.
- b. [Match Architect's sample][As selected by Architect from full range of industry colors and color densities].

2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Gold Anodic Finish: AAMA 611, AA-M32C22A43; gold color.

E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

F. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with [AAMA 2604][AAMA 2605] and containing not less than [50][70] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.9 COPPER-ALLOY FINISHES

A. Hand-Rubbed Finish, Lacquered: Directionally textured, fine satin, mechanical finish coated with lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of **1 mil (0.025 mm)**.

B. Statuary Conversion Coating over Satin Finish: Directionally textured, fine satin, mechanical finish with sulfide conversion coating.

1. Color: Match Architect's sample.
2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Directional Satin Finish: No. 4.

2.11 FIBERGLASS FINISHES

- A. Fiberglass: UV-light stable, hard, high-gloss gel coat or high-gloss, high-build polyurethane or polyester coating.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to[**Shop Drawings and**] manufacturer's written instructions.
- B. Mounting Brackets and Bases: Anchor brackets and bases securely to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION 10 75 23 00



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Task	Specification	Specification Description
10 75 23 00	10 75 16 00	Ground-Set Flagpoles
10 86 00 00	10 28 13 63	Detention Toilet Accessories
10 86 00 00	12 55 00 00	Detention Furniture



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SECTION 11 11 36 00 - VEHICLE CHARGING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Offboard electric vehicle charging system equipment.
2. Fleet electric vehicle charging system equipment with bidirectional capability.
3. Onboard electric vehicle supply equipment.

B. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies temperature, humidity, acoustical, and other field conditions applicable to the Work specified in this Section.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies seismic hazard, wind hazard, and other structural load design conditions applicable to the Work specified in this Section.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies concrete bases.
5. Section 260553 "Identification for Electrical Systems" specifies identification products.
6. Section 260573 "Power System Studies" specifies arc-flash hazard analysis, warning labels, and fault current withstand ratings referenced by this Section.
7. **[Section 262726 "Wiring Devices"] [Section 262726.31 "General-Grade Single Straight-Blade Receptacles"]** specifies 6-50R receptacles.
8. Section 262816 "Enclosed Switches and Circuit Breakers" specifies **[fused]** safety switches.

1.2 DEFINITIONS

- A. CCS: Combined charging system; a means for using the same connector port for both AC Level 2 charging and DC Level 3 fast charging.
- B. EV: Electric vehicle.
- C. EVCE: Electric vehicle charging system equipment. This term refers to DC Level 3 charging equipment located offboard the vehicle.
- D. EVSE: Electric vehicle supply equipment. This term refers to AC Level 2 charging equipment that depends on the built-in charger located onboard the vehicle.
- E. Fastened in Place: Does not require tools to be removed and replaced.
- F. Fixed in Place: Requires tools to be removed and replaced.
- G. NICET: National Institute for Certification in Engineering Technologies; a division of the National Society of Professional Engineers (NSPE).
- H. OCPP: Open Charge Point Protocol; an application protocol for communication between EVs and a central management system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
 - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.
2. Include manufacturer's sample extended warranty language.
3. **<Insert requirements>.**

B. Shop Drawings: Prepare and submit the following:

1. Routing and attachment of permanent wiring.
 - a. Include plans, elevations, sections, details, and attachments to other work.
 - b. **<Insert additional requirements for drawing content or format>.**

C. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.
 - a. Provide Drawings indicating location and number of EV charging units, and distance from building.
 - b. Provide Drawings indicating "reasonable accessibility" to EV charging units.
 - c. Provide Drawings indicating location and number of EV charging units, charging levels and connectors, distance from building, signage details, and ability of EV charging units to participate in a demand-response or time-of-use pricing program.
 - d. Provide Drawings indicating locations for AC Level 2 or greater EV charging equipment installed at each required parking space. Indicate distance from building, signage details, charging levels, types of vehicle connectors provided, and ability of EV charging units to participate in a demand-response or time-of-use pricing program.
 - e. Provide Drawings indicating locations for 208 to 240 V dedicated branch circuit in minimum Metric Designator 27 (Trade Size 1) conduit terminated in electrical box or enclosure installed and ready for connection to AC Level 2 or greater EV charging equipment at each required parking space.

D. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction test reports.
- B. Manufacturer's published instructions.

C. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Manufacturer's field reports for system startup support.
3. Field reports for software and firmware upgrades.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documentation.
- B. Software and firmware service agreement.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare parts.
- B. Special tools.

1.7 QUALIFICATIONS

- A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, to conduct tests of complex equipment, to analyze test and equipment data, to plan a job, and to lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.
- B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV certification. Able to conduct tests of complex metering and relay systems; to evaluate tests, test equipment, test results, and power system performance; to recommend actions to maintain or improve system performance; and to lead multi-team projects.
- C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from qualified electrical testing laboratory recognized by authorities having jurisdiction.
 1. On-site electrical testing supervisors must possess active NICET EPT Technician [III][IV] certification.
- D. Communications Cable Installer: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" and the following:
 1. Training and manufacturer certification to install, splice, and terminate communications cabling.
 2. Installation Supervisor: BICSI Technician (TECH) certification.
 3. Copper Installers: **[30 percent]<Insert quantity>** of employees possess BICSI Copper Installer 2 (INSTC) certification. Remaining employees possess BICSI Installer 1 (INST1) certification.
 4. Fiber Installers: **[30 percent]<Insert quantity>** of employees possess BICSI Optical Fiber Installer 2 (INSTF) certification. Remaining employees possess BICSI Installer 1 (INST1) certification.
- E. Communications Testing and Inspecting Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
 1. On-site communications testing supervisor must have **[BICSI Technician (TECH)]<Insert certification program>** certification and documented training, and be experienced with testing

communications equipment in accordance with **[BICSI]<Insert code enforced by authorities having jurisdiction>** testing standards.

1.8 PRECONSTRUCTION TESTING

- A. Wireless Survey: Complete wireless survey to determine if wireless provider signals meet or exceed manufacturer's recommended minimum values.
- B. Preconstruction Test Reports: Collect, assemble, and submit test reports prepared by qualified testing agency.

1.9 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that assembled and installed vehicle charging equipment performs in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: **[Two][Three][Four]<Insert number>** years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that vehicle charging equipment performs in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
 - 1. Initial Extended-Warranty Period: **[Three][Four][Five]<Insert number>** years from date of Substantial Completion; **[full][prorated]** coverage for labor, materials, and equipment.
 - 2. Follow-On Extended-Warranty Period: **[Eight]<Insert number>** years from date of Substantial Completion; **[full][prorated]** coverage for materials only, free on board **[origin][destination]**, freight prepaid.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Field Investigation and Approval Criteria: Installed **[DC electric vehicle charging system equipment with bidirectional capability][EVSE]** investigated and approved by **<Insert name of utility>** and labeled or marked before connection to power and system start-up.
- C. **<Insert additional performance requirements for the Project>**.

2.2 OFFBOARD ELECTRIC VEHICLE CHARGING SYSTEM EQUIPMENT

- A. Description: EVCE located offboard the vehicle that is designed for providing DC Level 3 fast charging of vehicle batteries.

B. UL FFTG - DC Level 3 EV Charging System Equipment (EVCE) :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Blink Charging]**
 - b. **[ChargePoint, Inc.; subsidiary of ChargePoint Holdings, Inc.]**
 - c. **[Efacec Electric Mobility; company of Efacec Power Solutions, SGPS, S.A.]**
 - d. **[FLO (FLO Services USA Inc. in USA, and Services FLO Inc. in Canada)/AddÉnergie Technologies Inc]**
 - e. **[Loop Global, Inc.]**
 - f. **[Wallbox USA; subsidiary of Wall Box Chargers S.L.U.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blink Charging]**
 - b. **[ChargePoint, Inc.; subsidiary of ChargePoint Holdings, Inc.]**
 - c. **[Efacec Electric Mobility; company of Efacec Power Solutions, SGPS, S.A.]**
 - d. **[FLO (FLO Services USA Inc. in USA, and Services FLO Inc. in Canada)/AddÉnergie Technologies Inc]**
 - e. **[Loop Global, Inc.]**
 - f. **[Wallbox USA; subsidiary of Wall Box Chargers S.L.U.]**
 - g. **<Insert manufacturer's name>**
3. Source Limitations: Obtain products from single manufacturer.
4. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. EVCE: UL CCN FFTG; including UL 2202.
 - b. Personnel Protection: UL CCN FFUQ2; including UL 2231-1 and UL 2231-2.
5. Standard Features: Complies with Article 625 of NFPA 70.
6. Sustainable Design Features:
 - a. Lead Content for Electrical Wire and Cable: Less than 300 ppm.
 - b. Equipment has earned ENERGY STAR product label.
 - c. Corporate Sustainability Report: Provide **[third-party-verified]** corporate sustainability report that is publicly available from manufacturer and that includes environmental impacts of extraction operations and activities associated with product and its supply chain.
 - d. Regional Materials (LEED): Provide documentation if product is sourced (extracted, manufactured, or purchased) within **100 miles (160 km)** of Project site.
 - e. Regional Materials (IgCC/ASHRAE 189.1): Provide documentation if product is sourced (extracted, harvested, recovered, or manufactured) within **500 miles (800 km)** of Project site. Identify percentage of product's travel that is by rail or water.
 - f. Third-Party Certification: Third-party certification, in accordance with multiple attribute standard(s) developed by consensus-based process from an approved standard development organization, is publicly available for product.
 - g. Third-Party-Verified Product Life-Cycle Assessment: Assessment covering cradle-to-gate scope, in accordance with ISO 14040 and ISO 14044, is publicly available for product.

7. Other Available Features Required by the Project:

- a. Location Rating: **[Indoor][Indoor/outdoor]**.
- b. Input Feeder Rating: 480Y/277 V(ac), three phase, 60 Hz, **[30 A][70 A][80 A][100 A][200 A][250 A][500 A]<Insert electrical rating>**.
- c. Output Quantity: **[1][2]<Insert number>**.
- d. Output Wiring: Flexible cord.
 - 1) Output Cable Nominal Length: **[14 ft (4.3 m)][25 ft (7.6 m)]<Insert length>**.
 - 2) Cable management system.
 - 3) Output Attachment Plug: **[CCS Combo 1 (SAE J1772)][CCS Combo 2 (IEC 62196-3)][and][CHAdemo (Japan)]<Insert configuration>**.
- e. Mounting: **[Concrete base mount][As indicated on Drawings]**.
- f. Metering: **[Revenue][Nonrevenue]** grade meter.
- g. Networking:
 - 1) Protocol: **[OCPP]<Insert protocol>**.
 - 2) WAN Communications: Cellular **[GSM][LTE]**.
 - 3) LAN Communications: **[802.11 b/g/n WiFi][Ethernet][Modbus][Zigbee]**.
 - 4) Capable of remote configuration and reporting.
- h. Authorization or Payment System:
 - 1) **[RFID reader][NFC reader][Bluetooth reader][Keypad][Proximity card reader][in accordance with Section 281500 "Integrated Access Control Hardware Devices."][in accordance with Section 281511 "Integrated Credential Readers and Entry Management."]**
 - 2) PCI compliant.
 - 3) Capable of remote control and authorization.

8. Accessories:

- a. Multifunctional Display: Provide electronic signage integral with charger pedestal that is capable of displaying operating instructions, video advertising, and other messages while charger is in operation.

2.3 FLEET ELECTRIC VEHICLE CHARGING SYSTEM EQUIPMENT WITH BIDIRECTIONAL CAPABILITY

- A. Description: EVCE located offboard the vehicle that is designed to use connected vehicle batteries through an inverter for electric utility peak shaving, or for supplying power to premise or load during utility power outage, and to DC Level 3 fast charge those vehicle batteries during off-peak times or when utility power becomes available.
- B. UL FFTN - Fleet DC Level 3 EV Charger with Utility Interactive Inverter :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Fermata, LLC d/b/a Fermata Energy]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Fermata, LLC d/b/a Fermata Energy]**
 - b. **<Insert manufacturer's name>**
3. Source Limitations: Obtain products from single manufacturer.
4. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Bidirectional EVCE: UL CCN FFTN; including UL Subject 9741.
 - b. Grid Interactive Equipment: UL CCN QIKH; including UL 1741.
 - c. Personnel Protection: UL CCN FFUQ2; including UL 2231-1 and UL 2231-2.
5. Standard Features:
 - a. Complies with Article 625 of NFPA 70.
 - b. Product reviewed and approved by **<Insert name of electric utility>**.
6. Sustainable Design Features:
 - a. Lead Content for Electrical Wire and Cable: Less than 300 ppm.
 - b. Equipment has earned ENERGY STAR product label.
 - c. Corporate Sustainability Report: Provide **[third-party-verified]** corporate sustainability report that is publicly available from manufacturer and that includes environmental impacts of extraction operations and activities associated with product and its supply chain.
 - d. Regional Materials (LEED): Provide documentation if product is sourced (extracted, manufactured, or purchased) within **100 miles (160 km)** of Project site.
 - e. Regional Materials (IgCC/ASHRAE 189.1): Provide documentation if product is sourced (extracted, harvested, recovered, or manufactured) within **500 miles (800 km)** of Project site. Identify percentage of product's travel that is by rail or water.
 - f. Third-Party Certification: Third-party certification, in accordance with multiple attribute standard(s) developed by consensus-based process from an approved standard development organization, is publicly available for product.
 - g. Third-Party-Verified Product Life-Cycle Assessment: Assessment covering cradle-to-gate scope, in accordance with ISO 14040 and ISO 14044, is publicly available for product.
7. Other Available Features Required by the Project:
 - a. Location Rating: **[Indoor][Indoor/outdoor]**.
 - b. Input Feeder Rating: 480Y/277 V(ac), three phase, 60 Hz, **[40 A][dual 40 A]<Insert electrical rating>**.
 - c. Output Quantity: **[1][2]<Insert number>**.
 - d. Output Wiring: Flexible cord.
 - 1) Output Cable Nominal Length: **[13 ft (4 m)]<Insert length>**.
 - 2) Output Attachment Plug: **[CHAdEMO (Japan)]<Insert configuration>**.
 - e. Mounting: **[Pedestal mount][Wall mount][As indicated on Drawings]**.
 - f. Networking:
 - 1) Protocol: Proprietary.
 - 2) WAN Communications: Cellular.

g. Authorization or Payment System:

1) Keypad.

2.4 ONBOARD ELECTRIC VEHICLE SUPPLY EQUIPMENT

A. Description: EVSE with input rated up to 600 V(ac) for AC Level 2 charging of vehicle batteries using the EV's onboard charger.

B. UL FFWA - AC Level 2 EV Supply Equipment (EVSE) :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Blink Charging]**
 - b. **[Bosch Automotive Service Solutions]**
 - c. **[ChargePoint, Inc.; subsidiary of ChargePoint Holdings, Inc.]**
 - d. **[ClipperCreek, Inc]**
 - e. **[Enel X North America, Inc.; Enel Group]**
 - f. **[EVBox Group; subsidiary of EVBox B.V.]**
 - g. **[EvoCharge]**
 - h. **[FLO (FLO Services USA Inc. in USA, and Services FLO Inc. in Canada)/AddÉnergie Technologies Inc]**
 - i. **[Leviton Manufacturing Co., Inc.]**
 - j. **[Loop Global, Inc.]**
 - k. **[Lynkwell]**
 - l. **[SemaConnect, Inc.; subsidiary of Blink Charging Co.]**
 - m. **[Siemens Industry, Inc.; Energy and Automation Division]**
 - n. **[Wallbox USA; subsidiary of Wall Box Chargers S.L.U.]**
 - o. **[Xeal]**
 - p. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blink Charging]**
 - b. **[Bosch Automotive Service Solutions]**
 - c. **[ChargePoint, Inc.; subsidiary of ChargePoint Holdings, Inc.]**
 - d. **[ClipperCreek, Inc]**
 - e. **[Enel X North America, Inc.; Enel Group]**
 - f. **[EVBox Group; subsidiary of EVBox B.V.]**
 - g. **[EvoCharge]**
 - h. **[FLO (FLO Services USA Inc. in USA, and Services FLO Inc. in Canada)/AddÉnergie Technologies Inc]**
 - i. **[Leviton Manufacturing Co., Inc.]**
 - j. **[Loop Global, Inc.]**
 - k. **[Lynkwell]**
 - l. **[SemaConnect, Inc.; subsidiary of Blink Charging Co.]**
 - m. **[Siemens Industry, Inc.; Energy and Automation Division]**
 - n. **[Wallbox USA; subsidiary of Wall Box Chargers S.L.U.]**
 - o. **[Xeal]**

- p. <Insert manufacturer's name>
3. Source Limitations: Obtain products from single manufacturer.
 4. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. EV Supply Equipment: UL CCN FFWA; including UL 2594.
 - b. Personnel Protection: UL CCN FFUQ2; including UL 2231-1 and UL 2231-2.
 5. Standard Features:
 - a. Complies with Article 625 of NFPA 70.
 - b. Product reviewed and approved by <Insert name of electric utility>.
 6. Sustainable Design Features:
 - a. Equipment has earned ENERGY STAR product label.
 - b. Lead Content for Electrical Wire and Cable: Less than 300 ppm.
 - c. Corporate Sustainability Report: Provide[**third-party-verified**] corporate sustainability report that is publicly available from manufacturer and that includes environmental impacts of extraction operations and activities associated with product and its supply chain.
 - d. Regional Materials (LEED): Provide documentation if product is sourced (extracted, manufactured, or purchased) within **100 miles (160 km)** of Project site.
 - e. Regional Materials (IgCC/ASHRAE 189.1): Provide documentation if product is sourced (extracted, harvested, recovered, or manufactured) within **500 miles (800 km)** of Project site. Identify percentage of product's travel that is by rail or water.
 - f. Third-Party Certification: Third-party certification, in accordance with multiple attribute standard(s) developed by consensus-based process from an approved standard development organization, is publicly available for product.
 - g. Third-Party-Verified Product Life-Cycle Assessment: Assessment covering cradle-to-gate scope, in accordance with ISO 14040 and ISO 14044, is publicly available for product.
 7. Other Available Features Required by the Project:
 - a. Location Rating: [**Indoor**][**Indoor/outdoor**].
 - b. Input Feeder Rating:
 - 1) 208 to 240 V(ac), single phase, 60 Hz, [**40 A**][**50 A**][**60 A**][**80 A**][**dual 80 A**][**100 A**]**<Insert electrical rating>**.
 - 2) 208 to 240 V(ac), three phase, 60 Hz, [**40 A**][**60 A**][**100 A**]**<Insert electrical rating>**.
 - c. Input Feeder Type: [**Hard wired**][**6-50R receptacle**].
 - d. Output Quantity: [**1**][**2**]**<Insert number>**.
 - e. Output Wiring: Flexible cord.
 - 1) Output Cable Nominal Length (Usable Length May Be Less): [**18 ft (5.5 m)**][**20 ft (6 m)**][**23 ft (7 m)**][**25 ft (7.6 m)**]**<Insert length>**.
 - 2) Cable management system.
 - 3) Output Attachment Plug: [**Type 1 (SAE J1772)**][**Type 2 (IEC 62196-2)**][**and**][**CHAdemo (Japan)**]**<Insert configuration>**.
 - f. Mounting: [**Concrete base mount**][**Pedestal mount**][**Pole mount**][**Wall mount**][**As indicated on Drawings**].
 - g. Metering: [**Revenue**][**Nonrevenue**] grade meter.
 - h. Networking:

- 1) Protocol: **[OCPP]<Insert protocol>**.
 - 2) WAN Communications: Cellular **[GSM][LTE]**.
 - 3) LAN Communications: **[802.11 b/g/n WiFi][Ethernet][Modbus][Zigbee]**.
 - 4) Capable of remote configuration and reporting.
- i. Authorization or Payment System:
- 1) **[RFID reader][NFC reader][Bluetooth reader][Keypad][Proximity card reader][in accordance with Section 281500 "Integrated Access Control Hardware Devices."][in accordance with Section 281511 "Integrated Credential Readers and Entry Management."]**
 - 2) PCI compliant.
 - 3) Capable of remote control and authorization.
8. Accessories:
- a. Multifunctional Display: Provide electronic signage integral with charger pedestal that is capable of displaying operating instructions, video advertising, and other messages while charger is in operation.

2.5 MAINTENANCE MATERIAL ITEMS

- A. Spare Parts: Furnish to Owner spare parts, for repairing vehicle charging equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. **[Include the following:]**
1. **<Insert item and quantity>**.
- B. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to vehicle charging equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. **[Include the following:]**
1. **<Insert name of special tool>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and bollards or posts for suitable conditions where vehicle charging equipment will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF VEHICLE CHARGING EQUIPMENT

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Communications Work: BICSI N1.
5. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
6. Electric Vehicle Power Transfer System: Article 625 of NFPA 70 and NECA NEIS 413.
7. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Hard-Wired Connection: Provide[**fusible**] safety switch, that is lockable in "Off" position, in readily accessible location for termination of input cable.
2. 250 V Plug-In Connection:
 - a. Provide 6-50R single receptacle not less than **18 inch (450 mm)** and not more than **4 ft (1.2 m)** above finished floor.
 - b. Remove plug and provide[**fusible**] safety switch, that is lockable in "Off" position, in readily accessible location for termination of input cable.
3. Fastened in Place: Comply with manufacturer's published instructions for installing mounting hardware. Provide manufacturer's recommended seismic controls when required for compliance with the Project's requirements.
4. Fixed in Place: Comply with manufacturer's published instructions for installation and torquing of hardware fasteners. Provide manufacturer's recommended seismic controls when required for compliance with the Project's requirements.
5. Base Mounting: When indicated on Drawings or in manufacturer's published instructions, provide concrete bases for installing vehicle charging equipment.
6. Identification: Provide labels for vehicle charging equipment and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each enclosure with engraved metal or laminated-plastic nameplate.
7. **<Insert more stringent installation requirements that supplement or supersede listed standards and manufacturer's published instructions>.**

D. Cybersecurity:

1. Software:
 - a. Coordinate security requirements with [IT department][CIO]<Insert entity responsible for IT security>.
 - b. Ensure that latest stable software release is installed and properly operating.
 - c. Disable or change default passwords to password of at least eight characters in length, using a combination of uppercase and lower letters, numbers, and symbols. Record passwords and turn over to party responsible for system operation and administration.
2. Hardware:
 - a. Coordinate location and access requirements with [IT department][CIO]<Insert entity responsible for IT security>.
 - b. Enable highest level of wireless encryption that is compatible with Owner's information and communications technology network.
 - c. Disable dual network connections.

E. Interfaces with Other Work:

1. Coordinate installation of new vehicle charging equipment with existing conditions.
 - a. **<Insert requirements for transition between new and existing>.**
2. Work must be rated to handle available fault current on input feeder.
3. Provide appropriate warning labels for arc-flash hazard on input feeder.
4. Coordinate with **<Insert Section number and title>** for **<Insert description of interfacing related Work>.**
 - a. **<Insert requirements for transition between this Section and related Work>.**

3.3 FIELD QUALITY CONTROL OF VEHICLE CHARGING EQUIPMENT

A. Administrant for Electrical Power Tests and Inspections:

1. **[Owner][Tenant]** will engage qualified electrical power testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified electrical power testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections[**with assistance of factory-authorized service representative**].

B. Administrant for Communications Tests and Inspections:

1. **[Owner][Tenant]** will engage qualified communications testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified communications testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections[**with assistance of factory-authorized service representative**].

C. Acceptance Testing Preparation:

1. **<Insert requirements>.**

D. Field tests and inspections must be witnessed by **[Architect][Tenant][authorities having jurisdiction]<Insert names or titles of witnesses>.**

E. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. For each unit of vehicle charging equipment, perform the following tests and inspections:
 - a. Unit self-test.
 - b. Operation test with load bank.
 - c. Operation test with EV.
 - d. Network communications test.

F. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

G. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

H. Manufacturer Services: Engage factory-authorized service representative to **[support][supervise]** field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.4 SYSTEM STARTUP

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.
2. **<Insert startup steps if any>.**

B. Manufacturer Services: Engage factory-authorized service representative to **[support][supervise]** system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 PROTECTION

A. After installation, protect vehicle charging equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.6 MAINTENANCE

A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software and firmware support for **[two]<Insert number>** years.
2. Upgrade Service: At Substantial Completion, update software and firmware to latest version. Install and program software and firmware upgrades that become available within **[two]<Insert number>** years from date of Substantial Completion. **[Verify that upgrading software includes operating system and new or revised licenses for using software.]**
 - a. Upgrade Notice: No fewer than **[30]<Insert number>** days to allow Owner to schedule and access the system **[and to upgrade computer equipment if necessary].**
3. Field Reports for Software and Firmware Upgrades: Prepare and submit report after each update, documenting upgrades installed.

END OF SECTION 11 11 36 00



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Task	Specification	Specification Description
11 11 36 13	11 11 36 00	Vehicle Charging Equipment



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SECTION 11 12 00 00 - PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatic barrier gates.
2. Vehicle detectors.
3. Traffic controllers.
4. Entry terminals.
5. Exit terminals.
6. Pay stations.
7. Fee computers.
8. Miscellaneous parking control equipment.
9. Parking facility management software.
10. Access control units.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for pipe bollards to protect parking control equipment.
2. Section 133423.16 "Fabricated Control Booths" for cashiers'/parking attendants' booths.
3. Section 281300 "Access Control Software and Database Management" for integrating parking control equipment with building access control.
4. Section 281500 "Access Control Hardware Devices" for parking control equipment access devices.
5. Section 283100 "Intrusion Detection" for integrating parking control equipment with the building intrusion detection system.
6. Section 283121 "Area and Perimeter Intrusion Detection" for integrating parking control equipment with the site security control system.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Verify that equipment operation is consistent with system description.
3. Review sequence of operation for each type of parking control equipment.
4. Review coordination of interlocked equipment specified in this Section and elsewhere.
5. Review required testing, inspecting, and certifying procedures.
6. **<Insert requirement>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for parking control equipment.

11 - Equipment

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties.

B. Shop Drawings: For parking control equipment.

1. Include plans, elevations, sections and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Vehicle Detectors: Layout and method of placement of vehicle loop detector system.

C. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** square in size.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish **6 inches (150 mm)** square in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For parking control equipment to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On **[USB media][and][approved online or cloud solution]**.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Gate Arms: **[Two]<Insert number>** breakaway gate arms for each gate installed, complete with accessory components.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Parking Control System: For the following types of parking management:
1. Transient Parking: Hourly rated parking, with fee paid while **[entering][exiting]**.
 2. Monthly Parking: Monthly rated parking, with fee paid by the month and access gained by access control card.
 3. Flat-Rate Parking: Unlimited-duration parking, with free gate entry and fixed-fee amount paid while exiting.
 4. Flat-Rate or Hourly Parking: Fee paid at central pay station after parking.
 5. Special-Event Parking: Duration-of-event parking, with fee paid while entering with gates up or down.
 6. Limited Date and Time Parking: Limited-duration parking, with predetermined fee access control card.
 7. Merchant Validated Parking: Fee set, reduced, or waived by merchant validation, with free gate entry and fee paid while exiting.
 8. Valet Parking: Assisted parking, with fee paid while entering or exiting.
 9. Hotel Guest Parking: Unlimited access for duration of stay, with access gained by access control card.
- B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SOURCE LIMITATIONS

- A. Obtain **[parking control equipment]<Insert equipment>** from single source from single manufacturer.

2.3 AUTOMATIC BARRIER GATES

- A. Automatic Barrier Gates: Provide parking control device consisting of operator and controller housed in a weathertight, tamper-resistant cabinet enclosure with gate arm. Device shall be activated by a signal from access or revenue control device. Fabricate unit with gate-arm height in down position of not more than **35 inches (889 mm)** above pavement.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amano Cincinnati, Inc]**
 - b. **[ASPS Access Security & Parking Systems Inc.]**
 - c. **[Automatic Systems]**
 - d. **[CAME Americas Automation LLC]**
 - e. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
 - f. **[Delta Scientific Corporation]**
 - g. **[DoorKing, Inc]**
 - h. **[Engineered Parking Systems, Inc]**
 - i. **[Falcon Eye Global Security, LLC]**
 - j. **[Hy-Security Gate, Inc.; Nice North America; Nice group]**
 - k. **[Magnetic AutoControl USA]**
 - l. **[Parking Systems, Inc.]**

- m. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [Automatic Systems]
 - d. [CAME Americas Automation LLC]
 - e. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - f. [Delta Scientific Corporation]
 - g. [DoorKing, Inc]
 - h. [Engineered Parking Systems, Inc]
 - i. [Falcon Eye Global Security, LLC]
 - j. [Hy-Security Gate, Inc.; Nice North America; Nice group]
 - k. [Magnetic AutoControl USA]
 - l. [Parking Systems, Inc.]
 - m. <Insert manufacturer's name>
 3. Standards: Barrier gate operators that are listed and labeled according to UL 325 by a qualified testing agency.
- B. Controller: Factory-sealed, solid-state, plug-in type, with galvanized-steel box for wiring connections. [Noncommunicating][Communicating] type.
 1. Noncommunicating Type:
 - a. Capable of logic for one- and two-way lanes.
 - b. Separate momentary contacts for transient patrons, monthly patrons, vehicle entries, and vehicle exits.
 2. Communicating Type:
 - a. Real-time communication of lane counts, status messages, and execute commands.
 - b. Monitor illegal entries and exits, tailgates, tickets, monthlies, and backouts.
 - c. Status messages for gate up too long, backouts, ticket in chute, and gate-arm rebound.
 - d. Communication commands for resetting loops, turning "Full" signs on/off, raising and lowering gate arm, and disabling [ticket dispensers][card readers][barcode imagers][license plate recognition][automatic vehicle identification].
 3. Physical Characteristics:
 - a. On-off power supply switch.
 - b. Automatic-manual switch.
 - c. Differential counter.
 - d. Communication port.
 - e. Internal [resettable][non-resettable] counters.
 - f. Thermal-overload protection with manual reset.
 - g. Plug-in connectors for [two][three] vehicle loop detectors.
 - h. Thermostatically controlled heater with on/off/auto switch.
 - i. Thermostatically controlled fan with on/off/auto switch.
 - j. Switch to test motor and limit switches.
 - k. Emergency manual disconnect.
 - l. Battery backup.

- m. [Single][Two][Four], 115-V ac grounded power receptacle.
 4. Operational Characteristics:
 - a. Able to store successive inputs and sequentially processing each one.
 - b. Automatic instant-reversing obstacle detector mechanism that stops downward motion of gate arm if arm contacts or nears an object and that immediately returns arm to upward position. Include a zero- to 60-second, variable-time reset device.
 - c. Directional arming logic.
 - d. Broken gate-arm monitoring.
 - e. Programmable[automatic] timer.
 - f. Diagnostic mode for on-site testing[, with LEDs for inputs and outputs].
 - g. Automatic and continuous testing of inputs and outputs.
 - h. Reversible arm capability for right- or left-handed operation.
- C. Cabinets: Fabricated from sheet metal with seams welded and ground smooth; approximately 15 inches square by 40 inches tall (381 mm square by 1016 mm tall). Provide single, gasketed access door for each cabinet with flush-mounted locks. Furnish [two]<Insert number> keys for each lock[, all locks keyed alike]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet.
 1. Steel Sheet: Not less than 0.097-inch- (2.5-mm-) thick[, galvanized-] steel sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
 2. Aluminum Sheet: Not less than 0.125-inch- (3.2-mm-) thick, aluminum sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
 3. Stainless-Steel Sheet: Not less than 0.109-inch- (2.8-mm-) thick, stainless-steel sheet.
 - a. Finish cabinet exterior with No. 4 finish.
- D. Straight Gate Arm: [1-by-4-inch nominal- (19-by-89-mm actual-) size pine or redwood][0.097-inch- (2.5-mm-) thick steel][Fiberglass, PVC, or polycarbonate][Aluminum].
 1. Traffic-Side Face: [Reflective painted finish and black diagonal stripes][Reflective painted finish and red diagonal stripes][Reflective painted finish and black and yellow diagonal stripes][Manufacturer's standard finish and striping].
 2. Length: [10 feet (3.0 m)][12 feet (3.7 m)][As indicated on Drawings]<Insert length>.
 3. Mounting Flange: Provide with breakaway feature to ensure a clean break if arm is struck by vehicle.
- E. Folding Gate Arm: Two pieces of 1-by-4-inch nominal- (19-by-89-mm actual-) size pine or redwood joined together with metal side brackets.
 1. Traffic-Side Face: [Reflective painted finish and black diagonal stripes][Reflective painted finish and red diagonal stripes][Reflective painted finish and black and yellow diagonal stripes][Manufacturer's standard finish and striping].
 2. Length: [10 feet (3.0 m)][12 feet (3.7 m)][As indicated on Drawings]<Insert length>.
 3. Mounting Flange: Provide with breakaway feature to ensure a clean break if arm is struck by vehicle.
- F. Straight Gate Arm with Counterbalance: 1-by-6-inch nominal- (19-by-140-mm actual-) size pine or

redwood with steel counterweights.

1. Traffic-Side Face: **[Reflective painted finish and black diagonal stripes][Reflective painted finish and red diagonal stripes][Reflective painted finish and black and yellow diagonal stripes][Manufacturer's standard finish and striping]**.
2. Length: **[16 feet (4.9 m)][As indicated on Drawings]<Insert length>**.
3. Mounting Flange: Provide with breakaway feature to ensure a clean break if arm is struck by vehicle.

- G. Wishbone-Style Gate Arm: **[1-by-4-inch nominal- (19-by-89-mm actual-) size pine or redwood][0.097-inch- (2.5-mm-) thick steel]** formed into wishbone configuration, with steel counterweights.

1. Traffic-Side Face: **[Reflective painted finish and black diagonal stripes][Reflective painted finish and red diagonal stripes][Reflective painted finish and black and yellow diagonal stripes][Manufacturer's standard finish and striping]**.
2. Length: **[14 feet (4.3 m)][As indicated on Drawings]<Insert length>**.
3. Mounting Flange: Provide with breakaway feature to ensure a clean break if arm is struck by vehicle.

- H. Operator: UL labeled and listed, **[Class I][Class II][Class III][Class IV]**. **[1/3][1/2]** hp; **<Insert number>**-V, 60-Hz, single-phase, instant-reversing, continuous-duty motor for operating gate arm. Transmit power to gate-arm drive shaft through the speed reducer to harmonic-acting crank and connecting rod. Fabricate crank, rod, and drive shaft of galvanized solid bar steel. Provide an operable cam for adjusting arm travel.

1. Opening Time: **[Three][Six]<Insert number>** seconds.
2. Inherently adjustable, torque limiting clutch for safety.

- I. Characteristics:

1. Audible alarm that activates as part of a safety device system.
2. Additional obstruction detector; noncontact **[infrared][photoelectric][radio-frequency barrier]**.
3. Gate-arm warning safety signs on both sides of unit to limit traffic to vehicular traffic.
4. Low-voltage **[yellow][red]** warning lights that illuminate when gate is in down position.
5. Low-voltage light on cabinet top that flashes or changes from red to green when barrier gate is operating.
6. LED integrated into gate-arm for increased visibility.
7. Manually operated crank for emergency operation.
8. Authorities having jurisdiction's emergency access by **<Insert type>**.
9. Gate-arm tip support **[with electromagnetic lock]**.
10. Gate-arm skirt bottom **[and top]**.

2.4 VEHICLE DETECTORS

- A. Vehicle Detectors: Provide detection devices that sense presence or transit of vehicles and emit signals activating gate-arm operators.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Amano Cincinnati, Inc]**

- b. [ASPS Access Security & Parking Systems Inc.]
 - c. [Delta Scientific Corporation]
 - d. [Engineered Parking Systems, Inc]
 - e. [Magnetic AutoControl USA]
 - f. [Parking Systems, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Amano Cincinnati, Inc]
- b. [ASPS Access Security & Parking Systems Inc.]
- c. [Delta Scientific Corporation]
- d. [Engineered Parking Systems, Inc]
- e. [Magnetic AutoControl USA]
- f. [Parking Systems, Inc.]
- g. <Insert manufacturer's name>

- B. Vehicle Loop Detector System: Self-tuning electronic presence detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light. Include automatic closing timer with adjustable time delay before closing[, **timer cut-off switch**,] designed to hold gate arm open until traffic clears. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location indicated on Drawings, as recommended in writing by detection system manufacturer for [**pave-over**][**saw-cut**] installation.

1. Field-Assembled Loop: Wire, in size indicated for field assembly.
2. Factory-Formed Loop: Wire, preformed in size indicated.
3. Operation:
 - a. Recognize vehicles within **6 inches (152 mm)** of each other on standard-sized loop.
 - b. Recognize vehicle direction by detecting vehicle moving from one loop to another.
 - c. Generate reverse count if vehicle backs up after generating directional count in forward direction.
 - d. Continuous diagnostic monitoring [**and memory**]for intermittently operating and failed loops.
 - e. Crosstalk test between adjacent loops.

- C. Active Infrared Vehicle Detector: [**Retroreflective**][**Emitter/receiver**]-type presence detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of vehicle in gate-arm pathway by interrupting infrared beam in zone pattern and to emit signal activating gate-arm operator. Include automatic closing timer with adjustable time delay before closing[, **timer cut-off switch**,] and vehicle presence detector designed to hold gate arm open until traffic clears.

2.5 TRAFFIC CONTROLLERS

- A. Traffic Controllers: Provide directional enforcement system that allows passage of vehicle in only one direction.
1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [Ameristar Perimeter Security; ASSA ABLOY]

- b. [Delta Scientific Corporation]
- c. [DoorKing, Inc]
- d. [Engineered Parking Systems, Inc]
- e. [Falcon Eye Global Security, LLC]
- f. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Ameristar Perimeter Security; ASSA ABLOY]
- b. [Delta Scientific Corporation]
- c. [DoorKing, Inc]
- d. [Engineered Parking Systems, Inc]
- e. [Falcon Eye Global Security, LLC]
- f. <Insert manufacturer's name>

- B. Penetrating Type: System consisting of multiple raised teeth that allow vehicular traffic in one direction and that puncture tires of vehicular traffic in the other direction. Fabricate system from steel plate contained in welded steel frame.

- 1. Mounting: [Surface][Recessed].
- 2. Operation: [Manual, with each tooth controlled by torsion spring][Electromechanical][Hydraulic].
- 3. Latch Down: Allow disarming for two-way traffic flow. Furnish [one]<Insert number> tool(s) for latch-down operation.
- 4. Illuminated Warning Signs: [Single][Double]-faced warning signs consisting of LED lamps [with photo cell control]and keyed on/off override switches, contained in welded steel bodies with baked-enamel or powder-coat finish and fiberglass sign faces[, with flood lamp].
 - a. Post Mounting: Provide [in-ground][surface-mounted] base sleeves and posts.
 - b. Sign Copy: ["Wrong Way, Stop, Severe Tire Damage."]["Warning, Do Not Back Up, Tire Damage."]<Insert message.>
- 5. Speed Bumps: [Composite plastic][Compression molded rubber compound] for speed reduction to 5 mph (8 km/h) or less.

- C. Nonpenetrating Type: System consisting of steel curb that allows traffic in only one direction. Fabricate system from steel plate contained in welded steel frame.

- 1. Mounting: [Surface][Recessed].
- 2. Operation: [Manual][Electromechanical][Hydraulic].

2.6 ENTRY TERMINALS

- A. Entry Terminals: Provide entry terminals with mechanisms, components, and controllers housed in cabinet enclosures.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amano Cincinnati, Inc]

- b. [ASPS Access Security & Parking Systems Inc.]
 - c. [CAME Americas Automation LLC]
 - d. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - e. [Engineered Parking Systems, Inc.]
 - f. [Falcon Eye Global Security, LLC]
 - g. [Parking Systems, Inc.]
 - h. [Zeag; HUB Parking Technology; FAAC Group]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [CAME Americas Automation LLC]
 - d. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - e. [Engineered Parking Systems, Inc.]
 - f. [Falcon Eye Global Security, LLC]
 - g. [Parking Systems, Inc.]
 - h. [Zeag; HUB Parking Technology; FAAC Group]
 - i. <Insert manufacturer's name>

B. Physical Characteristics:

- 1. Digital display, touchscreen, or LCD.
- 2. Time and date display.
- 3. Time Indicator: 24-hour cycle with [A.M. and P.M.][military-time] clock mechanism.
- 4. Voice annunciation.
- 5. Tickets: [Standard paper][Magnetic stripe][Barcode].
- 6. Removable ticket tray with capacity of [5000]<Insert number> fan-folded tickets.
- 7. Battery backup for clock and RAM memory.
- 8. Communication port.
- 9. Thermostatically controlled heater with on/off/auto switch.
- 10. Thermostatically controlled fan with on/off/auto switch.
- 11. Ticket printing and dispensing mechanism.
- 12. Credit card activation slot, credit card reader[with smart card reader], and "Insert Ticket/Card" message.
- 13. Access card reader.
- 14. Multiple ticket option for valet parking.
- 15. Intercom.
- 16. Pinhole camera.
- 17. Barcode imager scanner.
- 18. Proximity access reader.
- 19. Automatic vehicle identification reader.
- 20. License plate recognition.

C. Operational Characteristics:

- 1. Operation: [Standalone][Online communication to remote computer].
- 2. Activation by [button with "Push for Ticket" message][vehicle detector][credit card in/out][license plate recognition][automatic vehicle identification][proximity][scanned electronic or hardcopy media][access card]<Insert device>.
 - a. On activation by button, unit automatically records entry time[, license plate,] and date on ticket,[sounds buzzer,] dispenses ticket, and raises barrier gate.

- b. On activation by means other than button, credentials are recorded and signal is automatically sent to raise barrier gate.

- 3. Credit card pay on entry.
- 4. Automatic ticket validation.
- 5. Programmable ticket numbering.
- 6. Programmable facility code.
- 7. Programmable display.
- 8. Programmable timer for closing barrier gate.
- 9. Built-in-service diagnostics.
- 10. Low-ticket alarm.
- 11. Out-of-ticket alarm.
- 12. Ticket jam detection.
- 13. Test ticket printing.
- 14. Back-out ticket function.
- 15. Cancel transaction function.

- D. Cabinets: Fabricated from sheet metal with seams welded and ground smooth, approximately **15 inches square by 40 inches tall (381 mm square by 1016 mm tall)**; consisting of base and top components. Provide single, gasketed access door for each base component with flush-mounted locks. Furnish **[two]<Insert number>** keys for each lock[, **all locks keyed alike**]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet. Fabricate top component so it can be unlocked and opened for ticket loading and maintenance. Include flush-mounted lock in rear of top, keyed the same as base component lock.

- 1. Steel Sheet: Not less than **0.097-inch- (2.5-mm-)** thick[, **galvanized-**] steel sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard **[white][yellow]<Insert color>** baked-enamel or powder-coat finish.
- 2. Aluminum Sheet: Not less than **0.125-inch- (3.2-mm-)** thick, aluminum sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard **[white][yellow]<Insert color>** baked-enamel or powder-coat finish.
- 3. Stainless-Steel Sheet: Not less than **0.109-inch- (2.8-mm-)** thick, stainless-steel sheet.
 - a. Finish cabinet exterior with No. 4 finish.

- E. Ticket-Dispensing Mechanisms: Removable assembly, with **[self-sharpening ticket cutter][or][ticket burster]** and plug-in controller.

2.7 EXIT TERMINALS

- A. Exit Terminals: Provide exit terminals with controllers and components housed in cabinet enclosures.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amano Cincinnati, Inc]**
 - b. **[ASPS Access Security & Parking Systems Inc.]**
 - c. **[CAME Americas Automation LLC]**

- d. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - e. [Engineered Parking Systems, Inc]
 - f. [Parking Systems, Inc.]
 - g. [Zeag; HUB Parking Technology; FAAC Group]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [CAME Americas Automation LLC]
 - d. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - e. [Engineered Parking Systems, Inc]
 - f. [Parking Systems, Inc.]
 - g. [Zeag; HUB Parking Technology; FAAC Group]
 - h. <Insert manufacturer's name>

B. Physical Characteristics:

- 1. Digital display, touchscreen, or LCD.
- 2. Time and date display.
- 3. Voice annunciation.
- 4. Battery backup for clock and RAM memory.
- 5. Communication port.
- 6. Thermostatically controlled heater with on/off/auto switch.
- 7. Thermostatically controlled fan with on/off/auto switch.
- 8. Credit card activation slot, credit card reader[**with smart card reader**], and "Insert Ticket/Card" message.
- 9. Access card reader.
- 10. Ticket reader.
- 11. Receipt printer.
- 12. Intercom.
- 13. Pinhole camera.
- 14. Barcode imager scanner.
- 15. Proximity access reader.
- 16. Automatic vehicle identification reader.
- 17. License plate recognition.

C. Operational Characteristics:

- 1. [Standalone][Online communication to remote computer].
- 2. Activation by [ticket insertion][vehicle detector][credit card in/out][license plate recognition][automatic vehicle identification][proximity][scanned electronic or hardcopy media][access card]<Insert device>.
- 3. Activation results in the following:
 - a. Valid Prepaid Exit: Signal is automatically sent to raise barrier gate.
 - b. Pay at Exit: Parking fee is calculated and displayed for payment.
 - c. Invalid Exit: Activation is rejected and "Pay Cashier First" or "Return to Cashier" message is displayed.
- 4. Programmable lost ticket function.
- 5. Display fee.
- 6. Accept payment by [credit card][debit card][smart card][prepaid value card][scanned

- media][and][merchant ticket].**
- 7. Accept discounted coupons.
- 8. Print receipts on demand.
- 9. Programmable facility code.
- 10. Programmable grace period.
- 11. Programmable display.
- 12. Programmable timer for closing barrier gate.
- 13. Reports for events and exception events.
- 14. Programmable merchant validations.
- 15. Built-in service diagnostics.
- 16. Cancel transaction function.

D. Cabinets: Fabricated from sheet metal with seams welded and ground smooth; approximately **15 inches square by 40 inches tall (381 mm square by 1016 mm tall)**. Provide single, gasketed access door for each cabinet with flush-mounted locks. Furnish **[two]<Insert number>** keys for each lock[, **all locks keyed alike**]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet.

- 1. Steel Sheet: Not less than **0.097-inch- (2.5-mm-)** thick[, **galvanized-**] steel sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard **[white][yellow]<Insert color>** baked-enamel or powder-coat finish.
- 2. Aluminum Sheet: Not less than **0.125-inch- (3.2-mm-)** thick, aluminum sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard **[white][yellow]<Insert color>** baked-enamel or powder-coat finish.
- 3. Stainless-Steel Sheet: Not less than **0.109-inch- (2.8-mm-)** thick, stainless-steel sheet.
 - a. Finish cabinet exterior with No. 4 finish.

2.8 PAY STATIONS

- A. Pay Stations: Provide self-contained, cashiering **[central][entry][exit]** pay stations designed for self-service operation; with mechanisms, components, **[controllers,]** and fee computers housed in a combined enclosure.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Amano Cincinnati, Inc]**
 - b. **[ASPS Access Security & Parking Systems Inc.]**
 - c. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
 - d. **[Engineered Parking Systems, Inc]**
 - e. **[Parking Systems, Inc.]**
 - f. **[Zeag; HUB Parking Technology; FAAC Group]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Amano Cincinnati, Inc]
- b. [ASPS Access Security & Parking Systems Inc.]
- c. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
- d. [Engineered Parking Systems, Inc]
- e. [Parking Systems, Inc.]
- f. [Zeag; HUB Parking Technology; FAAC Group]
- g. <Insert manufacturer's name>

B. Physical Characteristics:

1. Digital display, touchscreen, or LCD.
2. Time and date display.
3. Voice annunciation.
4. Battery backup for clock and RAM memory.
5. Thermostatically controlled heater with on/off/auto switch.
6. Thermostatically controlled fan with on/off/auto switch.
7. Ticket printing and dispensing mechanism.
8. Credit card activation slot, credit card reader[**with smart card reader**], and "Insert Ticket/Card" message.
9. Bill acceptor.
10. Access card reader.
11. Ticket reader.
12. Printer.
13. Intercom.
14. Pinhole camera.
15. Barcode imager scanner.
16. Proximity access reader.
17. Automatic vehicle identification reader.
18. License plate recognition.

C. Operational Characteristics:

1. [**Standalone**][**Online communication to remote computer**].
2. Activation by [**ticket insertion**][**vehicle detector**][**credit card in/out**][**license plate recognition**][**automatic vehicle identification**][**proximity**][**scanned electronic or hardcopy media**][**access card**]<Insert device>.
3. Activation results in the following:
 - a. Valid Prepayment: Signal is automatically sent to raise barrier gate.
 - b. Payment Prompt: Parking fee is calculated and displayed for payment.
4. Compute multiple parking fees based on recorded entry times.
5. Compute multiple taxes by percentage and fixed amount.
6. Programmable lost ticket function.
7. Display fee.
8. Accept payment by cash and [**credit card**][**debit card**][**scanned media**][**smart card**][**prepaid value card**][**and**][**merchant ticket**].
9. Accept discounted coupons.
10. Compute change.
11. Print receipts on demand.
12. Print validation on ticket.
13. Print audit trail.
14. Programmable for up to [**six**]<Insert number> fee structures.
15. Test mode to verify accuracy of fee structure program.
16. Programmable time.
17. Programmable facility code.

18. Programmable grace period.
19. Programmable display.
20. Programmable timer for closing barrier gate.
21. Programmable merchant validations.
22. Built-in service diagnostics.
23. Print cash audit, revenue, operational, and statistical reports on demand.
24. Duress alarm output for emergencies.
25. Cancel transaction function.

- D. Cabinets: Fabricated from cold-rolled steel sheet with seams welded and ground smooth, approximately **36 inches wide by 18 inches deep by 60 inches tall (914 mm wide by 457 mm deep by 1524 mm tall)**. Provide single, gasketed access door with flush-mounted locks. Furnish **[two]<Insert number>** keys for each lock[, **all locks keyed alike**]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet.

1. Finish cabinet, interior and exterior, with manufacturer's standard **[white][yellow]<Insert color>** baked-enamel or powder-coat finish.

2.9 FEE COMPUTERS

- A. Fee Computers: Provide modular **[PC-based]** system. Register permanent record of each transaction in computer's memory.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Amano Cincinnati, Inc]**
- b. **[ASPS Access Security & Parking Systems Inc.]**
- c. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
- d. **[Engineered Parking Systems, Inc]**
- e. **[Falcon Eye Global Security, LLC]**
- f. **[Parking Systems, Inc.]**
- g. **[Zeag; HUB Parking Technology; FAAC Group]**
- h. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Amano Cincinnati, Inc]**
- b. **[ASPS Access Security & Parking Systems Inc.]**
- c. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
- d. **[Engineered Parking Systems, Inc]**
- e. **[Falcon Eye Global Security, LLC]**
- f. **[Parking Systems, Inc.]**
- g. **[Zeag; HUB Parking Technology; FAAC Group]**
- h. **<Insert manufacturer's name>**

- B. Physical Characteristics:

1. Touchscreen display.
2. Battery backup for clock and RAM memory.

3. Communication port.
4. **[Cash drawer][Two cash drawers].**
5. Standard ticket reader.
6. Magnetic stripe ticket reader.
7. Barcode ticket reader.
8. Credit card reader[**with smart card reader**].
9. Access card reader.
10. Proximity access reader.
11. Automatic Vehicle Identification reader.
12. License plate recognition.
13. **[Keyed][Keyless-membrane]** keypad.
14. Detachable printer.

C. Operational Characteristics:

1. Compute multiple parking fees based on entry times on ticket from ticket dispenser.
2. Compute multiple taxes by percentage and fixed amount.
3. Programmable lost ticket function.
4. Display fee on remote fee display device.
5. Credit card in/out.
6. Accept payment by cash and **[credit card][debit card][smart card][prepaid value card][and][merchant ticket]**.
7. Accept discounted coupons.
8. Control independent cash drawer.
9. Compute change.
10. Print receipts.
11. Print validation on ticket.
12. Print audit trail.
13. Reload value cards.
14. Interface to automatic barrier gate.
15. Programmable with up to **[six]<Insert number>** fee structures.
16. Programmable time.
17. Programmable keys.
18. Programmable for special events validations.
19. Programmable for automatic activation for limited date and time validations.
20. Programmable merchant validations.
21. Programmable valet parking.
22. Programmable hotel guest parking.
23. Three levels of security including cashier, supervisor, and master.
24. Recall last transaction.
25. Test mode to verify accuracy of fee structure program.
26. Built-in service diagnostics.
27. View cash audit, revenue, operational, and statistical reports on screen or print on demand.
28. Duress alarm output for emergencies.

D. Cash Drawer: Fabricated with a removable tray and drawer, with five compartments for paper currency and five compartments for coins.

E. Remote Fee Display: Single-faced signs designed for use with fee computer, consisting of **1-inch- (25-mm-)** tall, digital displays or LCDs contained in welded steel bodies with baked-enamel or powder-coat finish.

1. Messages: Amount due, "Thank You," "Closed," and time in A.M./P.M. format.
2. Mounting: **[Front of cashier's booth][42-inch- (1067-mm-) high pedestal]**.

2.10 MISCELLANEOUS PARKING CONTROL EQUIPMENT

- A. "Lot Full" Signs : Single-faced signs consisting of illumination source contained in welded steel bodies with extended hood and baked-enamel finish. Sign copy shall be [4 (102)]<Insert dimension> inches (mm) tall.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ASPS Access Security & Parking Systems Inc.]
 - b. [CAME Americas Automation LLC]
 - c. [Engineered Parking Systems, Inc]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ASPS Access Security & Parking Systems Inc.]
 - b. [CAME Americas Automation LLC]
 - c. [Engineered Parking Systems, Inc]
 - d. <Insert manufacturer's name>
 3. Type: [Flashing][Nonflashing].
 4. Operation: [Manual by push button][Automatic by barrier gate controller].
 5. Illumination: [Traffic signal lamps and colored][LED bulb and clear] acrylic sign face.
 6. Mounting: [Top of barrier gate cabinet][42-inch- (1067-mm-) high pedestal].

2.11 PARKING FACILITY MANAGEMENT SOFTWARE

- A. Parking Facility Management Software: Manufacturer's standard software that is compatible with security-access control system and that provides automatic facility monitoring, supervision, and remote control of parking control equipment from one or more locations.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - d. [WPS Parking Systems; Dynniq Group]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]

- d. **[WPS Parking Systems; Dynniq Group]**
- e. **<Insert manufacturer's name>**

B. Operation:

- 1. Collect data for revenue and activity reporting.
- 2. Collect data for access and space control.
- 3. Notification services.
- 4. On-line prepaid parking.
- 5. Event management.
- 6. Validation solutions.
- 7. License plate recognition systems.
- 8. Pay-by-phone.
- 9. Loyalty programs.
- 10. Track tickets.
- 11. Programmable parking control equipment.

2.12 ACCESS CONTROL UNITS

A. Access Control Units: Provide access control unit that activates barrier gates.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Amano Cincinnati, Inc]**
 - b. **[ASPS Access Security & Parking Systems Inc.]**
 - c. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
 - d. **[DoorKing, Inc]**
 - e. **[Engineered Parking Systems, Inc]**
 - f. **[Falcon Eye Global Security, LLC]**
 - g. **[Nortek Security & Control, LLC]**
 - h. **[Parking Systems, Inc.]**
 - i. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amano Cincinnati, Inc]**
 - b. **[ASPS Access Security & Parking Systems Inc.]**
 - c. **[Canadian Parking Equipment Ltd./American Parking Equipment Inc.]**
 - d. **[DoorKing, Inc]**
 - e. **[Engineered Parking Systems, Inc]**
 - f. **[Falcon Eye Global Security, LLC]**
 - g. **[Nortek Security & Control, LLC]**
 - h. **[Parking Systems, Inc.]**
 - i. **<Insert manufacturer's name>**

B. Unit Housing: Fabricate from **[welded cold-rolled steel or aluminum sheet][plastic]** with weatherproof front access panel equipped with flush-mounted lock and **[two]<Insert number>** keys. Provide face-lighted unit fully visible at night.

- 1. Steel Finish: Manufacturer's standard baked-enamel or powder-coat finish system.

- C. Card Reader Controlled Unit: Functions only when authorized card is presented.
1. System: **[Magnetically coded, single-code system activated by coded card][Programmable, multiple-code capability permitting validation or voiding of individual cards]**.
 - a. Permit four different access time periods.
 2. Reader Type: **[Swipe][Insertion][Proximity]**.
 - a. Swipe reader for **[magnetic-stripe][barcode][Wiegand]** cards.
 - b. Insertion reader for **[magnetic-stripe][barcode][Wiegand]** cards.
 - c. Proximity reader for proximity cards.
 3. Operation: **[Standalone][Online communication to remote parking control system computer][Online communication to remote security-access control system computer]**.
 4. Characteristics: **[Timed antipassback][Limited-time usage][Capable of monitoring and auditing barrier gate activity][Digital display or LCD][Programmable by PDA (personal digital assistant) by infrared interface]<Insert feature>**.
 5. Mounting: **[With pedestal][Wall][In enclosed cabinet][As indicated on Drawings]<Insert mounting>**.
 6. Cards: Provide **<Insert number>**.
 - a. Imprint cards with **<Insert special printing requirements such as company logo or emblem>**.
- D. Digital Keypad Controlled Unit: Functions only when authorized code is entered on **[keyed][keyless-membrane]** keypad.
1. System: **[Multiple-code capability][Programmable, multiple-code capability]**.
 - a. Multiple-code capability of no fewer than **[five][100][500]<Insert number>** possible individual codes.
 - b. Programmable, multiple-code capability permitting validation or voiding of no fewer than **[100][2500][10,000]<Insert number>** possible individual codes, consisting of **[one to six]<Insert number>** digits[, and permitting four different access time periods].
 2. Operation: **[Standalone][Online communication to remote parking control system computer][Online communication to remote security-access control system computer]**.
 3. Characteristics: **[Timed antipassback][Limited-time usage][Capable of monitoring and auditing barrier gate activity]<Insert feature>**.
 4. Mounting: **[With pedestal][Wall][As indicated on Drawings]<Insert mounting>**.
- E. Radio-Controlled System: Digital access control system consisting of code-compatible universal coaxial receiver[, **one per barrier gate**], **where indicated on Drawings**, remote antenna with coaxial cable and mounting brackets, and **[one permanently mounted][four portable]<Insert number and use condition>** transmitter(s) per receiver designed to operate barrier gates. Provide programmable transmitter with multiple-code capability permitting validation or voiding of no fewer than **[1000][10,000]<Insert number>** codes per channel configured for the following functions:
1. Transmitters: **[Single-button][Triple-button]** operated.
 - a. Single-button operated with **[open][open and close]** functions.
 - b. Triple-button operated with open, close, and stop functions.
 - 1) Provide transmitters featuring **[two][three][four]<Insert number>** independent

channel settings controlling separate receivers for operating more than one barrier gate from each transmitter.

2.13 ANCHORAGES

- A. Anchor Bolts: **[Galvanized][Stainless steel]**.
 - 1. Hot-dip galvanized according to ASTM A153/A153M and ASTM F2329/F2329M.
 - 2. Stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including equipment bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before parking control equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Excavation for Traffic Controllers: Saw cut existing pavement for recessed traffic controllers and hand-excavate recesses to dimensions and depths and at locations as required by traffic controller manufacturer's written instructions and as indicated on Drawings.

3.3 INSTALLATION, GENERAL

- A. Install parking control equipment as required for complete and integrated installation.
 - 1. Rough-in electrical connections.

3.4 INSTALLATION OF AUTOMATIC BARRIER GATES

- A. Anchor cabinets to concrete bases with anchor bolts or expansion anchors, and mount barrier gate arms.
 - 1. Install barrier gates according to UL 325.

3.5 INSTALLATION OF VEHICLE DETECTORS

- A. **[Cut grooves in pavement and bury][Bury]** and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to parking control equipment operated by detector.

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3.6 INSTALLATION OF TRAFFIC CONTROLLERS

- A. Anchor controllers to **[recessed concrete bases][driveway surfaces]** with anchor bolts or expansion anchors.

3.7 INSTALLATION OF ENTRY TERMINALS

- A. Attach cabinets to concrete bases with anchor bolts or expansion anchors.
 - 1. Connect equipment to remote computer.
 - 2. Load ticket dispenser with supply of tickets.

3.8 INSTALLATION OF EXIT TERMINALS

- A. Attach cabinets to concrete bases with anchor bolts or expansion anchors.
 - 1. Connect equipment to remote computer.
 - 2. Load ticket dispenser with supply of tickets.

3.9 INSTALLATION OF PAY STATIONS

- A. Attach cabinets to concrete bases with anchor bolts or expansion anchors.
 - 1. Connect equipment to remote computer.
 - 2. Load ticket dispenser with supply of tickets.

3.10 INSTALLATION OF FEE COMPUTERS

- A. Install computers at locations indicated, including connecting to peripheral equipment **[and remote computers]**.

3.11 INSTALLATION OF CARD READER PEDESTALS

- A. **[Pad][In-ground]** mount with mounting bolts.

3.12 INSTALLATION OF ELECTRICAL

- A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect

components, assemblies, and equipment installations, including connections.

- C. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Parking control equipment will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.14 ADJUSTING

- A. Adjust parking control equipment to function smoothly, and lubricate as recommended by manufacturer.
- B. Confirm that locks engage accurately and securely without forcing or binding.
- C. After completing installation of exposed, factory-finished parking control equipment, inspect exposed finishes and repair damaged finishes.

3.15 PROTECTION

- A. Remove barrier gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

3.16 MAINTENANCE SERVICE

- A. Maintenance Service Description: Beginning at Substantial Completion, maintenance service shall include **[three][six][nine][12]** months' full maintenance by **[skilled employees of parking control equipment installer][manufacturer's authorized service representative]**. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper parking control equipment operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.17 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for **[two]<Insert number>** years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within **[two]<Insert number>** years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least **[30]<Insert number>** days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.



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3.18 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain parking control equipment.

3.19 PARKING CONTROL EQUIPMENT SCHEDULE

- A. Provide parking control equipment for each lane as follows:
 - 1. Lane **<Insert designation>**: **<Insert list of equipment>**.

END OF SECTION 11 12 00 00



Task	Specification	Specification Description
11 12 16 00	11 12 00 00	Parking Control Equipment
11 12 16 00	13 34 23 16	Fabricated Control Booths
11 12 23 00	11 12 00 00	Parking Control Equipment
11 12 23 00	13 34 23 16	Fabricated Control Booths
11 12 26 00	11 12 00 00	Parking Control Equipment
11 12 26 13	11 12 00 00	Parking Control Equipment
11 12 26 13	13 34 23 16	Fabricated Control Booths
11 12 33 00	11 12 00 00	Parking Control Equipment
11 12 33 13	11 12 00 00	Parking Control Equipment
11 12 36 00	11 12 00 00	Parking Control Equipment



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SECTION 11 13 13 00 - LOADING DOCK BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes loading dock bumpers.
- B. Related Requirements:
 - 1. Section 111319 "Stationary Loading Dock Equipment" for loading dock bumpers that are integral with dock levelers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of loading dock bumper.
- B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 LOADING DOCK BUMPERS

- A. Dock Bumpers: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Floor Products Company, Inc]**
 - b. **[Beacon Industries, Inc]**
 - c. **[Chalfant Sewing Fabricators, Inc]**
 - d. **[Durable Corporation]**
 - e. **[Hugger Dock Equipment Company; Columbus Foam Products, Inc.]**
 - f. **[Kelley; Entrematic; ASSA ABLOY]**
 - g. **[Pioneer Dock Equipment]**
 - h. **[Rite-Hite Holding Corporation]**
 - i. **[Rotary Products Inc]**
 - j. **[Serco; Entrematic; ASSA ABLOY]**
 - k. **[Super Seal Mfg. Ltd]**
 - l. **[Vestil Manufacturing Company]**
 - m. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [American Floor Products Company, Inc]
 - b. [Beacon Industries, Inc]
 - c. [Chalfant Sewing Fabricators, Inc]
 - d. [Durable Corporation]
 - e. [Hugger Dock Equipment Company; Columbus Foam Products, Inc.]
 - f. [Kelley; Entrematic; ASSA ABLOY]
 - g. [Pioneer Dock Equipment]
 - h. [Rite-Hite Holding Corporation]
 - i. [Rotary Products Inc]
 - j. [Serco; Entrematic; ASSA ABLOY]
 - k. [Super Seal Mfg. Ltd]
 - l. [Vestil Manufacturing Company]
 - m. <Insert manufacturer's name>
3. Source Limitations: Obtain from single source from single manufacturer.
- B. Laminated-Tread Loading Dock Bumper : Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two **3/4-inch- (19-mm-)** diameter, steel supporting rods that are welded at one end to **1/4-inch- (6-mm-)** thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than **1 inch (25 mm)** of tread plies extending beyond the face of closure angles.
1. Thickness: **[4-1/2 inches (114 mm)][6 inches (152 mm)][As indicated on Drawings]<Insert dimension>**.
 2. Horizontal Style: **[6 inches (152 mm)][10 inches (250 mm)][12 inches (305 mm)]** high by **[length indicated on Drawings]<Insert dimension>**.
 3. Vertical Style: **8 inches (203 mm)** wide by **[20 inches (508 mm) high][24 inches (610 mm) high][36 inches (914 mm) high][height indicated on Drawings]<Insert dimension>**.
- C. Molded-Rubber Loading Dock Bumpers : Fabricated from molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240; of size and configuration indicated. Fabricate units with not less than two predrilled anchor holes.
1. Configuration: **[T shape][Inverted-L shape][Square][Rectangular][As indicated on Drawings]<Insert configuration>**.
 2. Thickness: **[2 inches (50 mm)][3 inches (76 mm)][4 inches (102 mm)][6 inches (152 mm)][As indicated on Drawings]<Insert dimension>**.
- D. Extruded-Rubber Loading Dock Bumpers : Fabricated from ASTM D2000, extruded synthetic rubber with Shore A durometer hardness of 75, plus or minus 5, when tested according to ASTM D2240; of size and configuration indicated. Furnish units with predrilled anchor holes and concealed, flat, steel mounting bar.
1. Configuration: **[Flat or ribbed, with 2-inch (50-mm) nominal thickness and 9-inch (229-mm) height][4-1/2-inch- (114-mm-) wide base and 4-inch (102-mm) depth with half-oval shape that compresses and returns to original shape][As indicated on Drawings]<Insert configuration>**.
- E. Steel-Face, Laminated-Tread Loading Dock Bumpers : Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires and with **3/8-inch (9.5-mm)** steel faceplate of same size as rubber surface. Laminate plies under pressure on not less than two **3/4-inch- (19-mm-)** diameter, steel supporting rods that are welded at one end to **1/4-inch- (6-mm-)** thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized

to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles. Weld faceplate to two steel support brackets, which shall extend back to and engage 3/4-inch- (19-mm-) diameter support rods in elongated holes, allowing steel face to float on impact.

1. Thickness: [4-1/2 inches (114 mm)][6 inches (152 mm)][As indicated on Drawings]<Insert dimension>.
 2. Horizontal Style: [6 inches (152 mm)][10 inches (250 mm)][12 inches (305 mm)] high by [length indicated on Drawings]<Insert dimension>.
 3. Vertical Style: 8 inches (203 mm) wide by [20 inches (508 mm) high][24 inches (610 mm) high][36 inches (914 mm) high][height indicated on Drawings]<Insert dimension>.
- F. Anchorage Devices: Galvanized-steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated. Hot-dip galvanized according to ASTM A153/A153M or ASTM F2329/F2329M.
- G. Materials: ASTM A36/A36M for steel plates, shapes, and bars. Hot-dip galvanize according to ASTM A123/A123M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Loading Dock Bumpers: Attach loading dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
 1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
 3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.

3.3 ADJUSTING

- A. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 11 13 13 00



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SECTION 11 13 16 00 - LOADING DOCK SEALS AND SHELTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-pad loading dock seals.
2. Inflatable loading dock seals.
3. Frame-type loading dock shelters.
4. Inflatable loading dock shelters.
5. Transparent-strip door curtains.

1.2 COORDINATION

- A. Coordinate sizes and configurations of dock seals with finish grade slopes, walls, dock configuration, doors, dock bumpers, and other adjacent construction.
- B. Coordinate sizes, configurations, and mounting of transparent-strip door curtains with walls, doors, dock levelers, and other adjacent construction.
- C. Electrical System Roughing-in: Coordinate layout and installation of motor/blower and activation switch with connections to power supplies[**and interlock to other dock equipment**].

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include electrical characteristics of inflatable blower motor.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Detail assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of anchors and field connection.
3. Include diagrams for power, signal, and control wiring of inflatable blower motor.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For each type of fabric indicated.

E. Samples for Verification: For each type of fabric indicated.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For inflatable units to include in operation and maintenance manuals.

11 - Equipment

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of dock openings and contiguous construction by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FOAM-PAD LOADING DOCK SEALS

- A. Foam-Pad Dock Seals: Dock seals consisting of fabric-covered foam pads designed to compress **4 to 5 inches (102 to 127 mm)** under pressure of truck body to form an airtight seal at jambs and head of loading dock openings; of type, size, and construction indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Beacon Industries, Inc]**
 - b. **[Blue Giant Equipment Corporation]**
 - c. **[Chalfant Sewing Fabricators, Inc]**
 - d. **[Fairborn U.S.A., Inc.]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[McGuire; Systems, LLC]**
 - g. **[Nordock Inc.]**
 - h. **[NOVA Technology International, L.L.C.]**
 - i. **[Pentalift Equipment Corporation]**
 - j. **[Pioneer Dock Equipment]**
 - k. **[Rite-Hite Holding Corporation]**
 - l. **[Rotary Products Inc]**
 - m. **[Serco; Entrematic; ASSA ABLOY]**
 - n. **[Super Seal Mfg. Ltd]**
 - o. **[Vestil Manufacturing Company]**
 - p. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Beacon Industries, Inc]**
 - b. **[Blue Giant Equipment Corporation]**
 - c. **[Chalfant Sewing Fabricators, Inc]**
 - d. **[Fairborn U.S.A., Inc.]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[McGuire; Systems, LLC]**
 - g. **[Nordock Inc.]**
 - h. **[NOVA Technology International, L.L.C.]**

- i. **[Pentalift Equipment Corporation]**
 - j. **[Pioneer Dock Equipment]**
 - k. **[Rite-Hite Holding Corporation]**
 - l. **[Rotary Products Inc]**
 - m. **[Serco; Entrematic; ASSA ABLOY]**
 - n. **[Super Seal Mfg. Ltd]**
 - o. **[Vestil Manufacturing Company]**
 - p. **<Insert manufacturer's name>**
3. Source Limitations: Obtain from single source from single manufacturer.
- B. Stationary Head Pad: **[8 inches (203 mm)][12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)]** high and same depth as jamb pads; **beveled**; sized for opening width.
- C. Adjustable Head Pad: **[18 inches (457 mm)][24 inches (610 mm)][30 inches (762 mm)]** high and same depth as jamb pads; sized for opening width; with manufacturer's standard hardware and tension spring or counterweight mechanism for adjusting pad height.
- D. Jamb Pads: **[Square][Beveled; tapered to reduce opening width][V-shaped]**.
 1. Nominal Size: **[8 inches (203 mm) wide][12 inches (305 mm) wide][As indicated on Drawings]<Insert size>** and sized for opening height.
- E. Construction: Consisting of single- or double-ply, coated, fabric-covered, urethane-foam core with supporting frame. Fabricate jamb and head pads of same depth and sized for opening width.
 1. Wood Support Frame: Factory-painted[, **pressure-treated**] wood; with steel mounting hardware.
 2. Steel Support Frame: Steel channel frame of manufacturer's standard weight, shape, and finish; with steel mounting hardware.
 - a. Steel Finish: Hot-dip galvanize components to comply with the following:
 - 1) ASTM A123/A123M for iron and steel support framing.
 - 2) ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.
 3. Tapered Side Panels: Taper side panels to angle required to accommodate sloped loading dock approach grades, and make sealing edge of dock seal parallel to back edge of truck. Taper for **[declined approach][inclined approach][approach as indicated on Drawings]**.
 4. Guide Strips: **4-inch- (102-mm-)** wide, coated, nylon guide strips on jamb pads.
 5. Pleated Protectors: On face of jamb pads of overlapping layers of coated fabric attached to base fabric; **[4-inch (102-mm)][8-inch (203-mm)][16-inch (406-mm)]** wear exposure.
 6. Reinforcing: Manufacturer's standard reinforcing over cover fabric on **[upper corners][inside face of jamb pads][inside and full face of jamb pads and upper corners]<Insert location>** of dock seal.
- F. Materials:
 1. Vinyl-Coated Nylon Cover Fabric: Minimum total weight of **[22 oz./sq. yd. (746 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)]**.
 - a. Color: **[Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 - 1) High-Visibility Layer: Manufacturer's standard yellow or orange layer.

2. Neoprene-Coated Nylon Cover Fabric: Minimum total weight of [16 oz./sq. yd. (543 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)][45 oz./sq. yd. (1526 g/sq. m)].
 - a. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - 1) High-Visibility Layer: Manufacturer's standard yellow or orange layer.
3. Hypalon-Coated Nylon Cover Fabric: Minimum total weight of [16 oz./sq. yd. (543 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)].
 - a. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - 1) High-Visibility Layer: Manufacturer's standard yellow or orange layer.
4. Cover Fabric: Manufacturer's proprietary cover fabric complying with the following minimum requirements:
 - a. Tearing strength of not less than [300 by 300 (1334 by 1334)]<Insert value> lbf (N) when tested according to ASTM D2261.
 - b. Abrasion resistance of not less than [6000]<Insert number> cycles when tested according to FED-STD-191A-5306.
 - c. Tensile strength of not less than [1200 by 1200 (5338 by 5338)]<Insert value> lbf (N) when tested according to FED-STD-191A-5100.1.
 - d. Cold resistance to minus 40 deg F (minus 40 deg C) when tested according to FED-STD-191A-5874.
 - e. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - 1) High-Visibility Layer: Manufacturer's standard yellow or orange layer.
5. Pleated Protectors: Same fabric as cover.
6. Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried.
7. Pressure-Treated Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried, and pressure treated with waterborne preservatives to comply with AWPA U1; Use Category UC3.
 - a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2.3 INFLATABLE LOADING DOCK SEALS

- A. Inflatable Dock Seals: Inflatable dock seals consisting of one-piece jamb[, sill,] and header seals designed to inflate by motor/blower and compress against truck bodies to form airtight seals at loading dock openings; of type, size, and construction indicated.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Kelley; Entrematic; ASSA ABLOY]
 - b. [Pentalift Equipment Corporation]
 - c. [Serco; Entrematic; ASSA ABLOY]
 - d. [Super Seal Mfg. Ltd]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Kelley; Entrematic; ASSA ABLOY]
 - b. [Pentalift Equipment Corporation]
 - c. [Serco; Entrematic; ASSA ABLOY]
 - d. [Super Seal Mfg. Ltd]
 - e. <Insert manufacturer's name>
3. Source Limitations: Obtain from single source from single manufacturer.
- B. Head Members: [One][Two]<Insert number>.
- C. Jamb Members: [One][Two]<Insert number>.
- D. Construction: Fabricate header seal full width over jamb seals. Mount seals on pressure-treated wood frame with hot-dip galvanized-steel mounting hardware. Inflate seals by use of 1/2-hp motor/blower mounted above header seal in galvanized-steel hood with separate manual on/off activation switch with indicator light. **[Provide electrical interlock.]** Provide bottom of header and jamb seals with grommets to allow for release of moisture and excess air.
- E. Materials:
 1. Neoprene-Coated Nylon Fabric: Minimum total weight of **14 oz./sq. yd. (475 g/sq. m)**.
 - a. Color: [Black][Gray][Blue][Brown][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 2. Fabric: Manufacturer's proprietary fabric complying with the following minimum requirements:
 - a. Tearing strength of not less than [110 by 85 (489 by 378)]<Insert value> lbf (N) when tested according to ASTM D2261.
 - b. Abrasion resistance of not less than [490]<Insert number> cycles when tested according to FED-STD-191A-5306.
 - c. Tensile strength of not less than [500 by 440 (2224 by 1957)]<Insert value> lbf (N) when tested according to FED-STD-191A-5100.1.
 - d. Cold resistance to **minus 40 deg F (minus 40 deg C)** when tested according to FED-STD-191A-5874.
 - e. Color: [Black][Gray][Blue][Brown][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- F. Steel Finish: Hot-dip galvanize components to comply with the following:
 1. ASTM A123/A123M for iron and steel support framing.
 2. ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.

2.4 FRAME-TYPE LOADING DOCK SHELTERS

- A. Frame-Type Dock Shelters: Dock shelters designed to form a seal with sides and top of truck body while leaving entire width and height of truck's rear opening unobstructed; of type, size, and construction indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Beacon Industries, Inc]**
 - b. **[Blue Giant Equipment Corporation]**
 - c. **[Chalfant Sewing Fabricators, Inc]**
 - d. **[Fairborn U.S.A., Inc.]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[McGuire; Systems, LLC]**
 - g. **[Nordock Inc.]**
 - h. **[NOVA Technology International, L.L.C.]**
 - i. **[Pentalift Equipment Corporation]**
 - j. **[Pioneer Dock Equipment]**
 - k. **[Rite-Hite Holding Corporation]**
 - l. **[Rotary Products Inc]**
 - m. **[Serco; Entrematic; ASSA ABLOY]**
 - n. **[Super Seal Mfg. Ltd]**
 - o. **[Vestil Manufacturing Company]**
 - p. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Beacon Industries, Inc]**
 - b. **[Blue Giant Equipment Corporation]**
 - c. **[Chalfant Sewing Fabricators, Inc]**
 - d. **[Fairborn U.S.A., Inc.]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[McGuire; Systems, LLC]**
 - g. **[Nordock Inc.]**
 - h. **[NOVA Technology International, L.L.C.]**
 - i. **[Pentalift Equipment Corporation]**
 - j. **[Pioneer Dock Equipment]**
 - k. **[Rite-Hite Holding Corporation]**
 - l. **[Rotary Products Inc]**
 - m. **[Serco; Entrematic; ASSA ABLOY]**
 - n. **[Super Seal Mfg. Ltd]**
 - o. **[Vestil Manufacturing Company]**
 - p. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain from single source from single manufacturer.
- B. Rigid-Frame Type: Fabricated from **[fabric-covered][fiberglass]** side and top panels attached to fixed supporting framework. Provide head and side curtains with built-in flexible stays, wind straps between head curtain and side frame, pleated protectors, reinforcing, and guide strips. Slope head frame from center for drainage. Provide replaceable, fabric-covered, tapered, foam-bottom pads and protective

steel bumpers of size and type required for application shown.

- C. Flexible-Frame Type: Fabricated from fabric-covered side and top panels attached to retractable supporting framework with independent spring-tension extension arms. Provide head and side curtains with built-in flexible stays, pleated protectors, reinforcing, and guide strips. Provide replaceable, fabric-covered, tapered, foam-bottom pads of size and type required for application shown.
- D. Head-Pad Height: [12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)][30 inches (762 mm)].
- E. Construction: Fabricate framework, pads, bumpers, fabric for curtains and panels, and other components to sizes and shapes indicated or required to fit door-opening sizes shown, and allow for not less than **18 inches (457 mm)** of truck-body penetration when truck is docked.
 - 1. Wood Framework: Factory painted; mechanically fastened together using nails and lag bolts or metal connectors to form a rigid assembly.
 - 2. Steel Framework: Zinc-plated steel tubing of size and thickness standard with manufacturer, with joints welded.
 - a. Steel Finish: Hot-dip galvanize components to comply with the following:
 - 1) ASTM A123/A123M for iron and steel support framing.
 - 2) ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.
 - 3. Top and Side Panels:
 - a. White, translucent fiberglass, **0.045 inch (1.1 mm)** thick, weighing **6 oz./sq. ft. (1831 g/sq. m)**.
 - b. White, translucent vinyl, weighing **14 oz./sq. ft. (4272 g/sq. m)**.
 - 4. Tapered Side Panels: Taper side panels to angle required to accommodate sloped loading dock approach grades, and make sealing edge of dock shelter parallel to back edge of truck. Taper for **[declined][inclined]** approach.
 - 5. Guide Strips: **4-inch- (102-mm-)** wide, coated, nylon guide strips on side curtains.
 - 6. Pleated Protectors: On head curtain of overlapping layers of coated fabric attached to base fabric.
 - 7. Reinforcing: Manufacturer's standard reinforcing over cover fabric on side curtains **[and top cover]**of dock shelter.
- F. Fabric:
 - 1. Vinyl-Coated Nylon Cover Fabric: Minimum total weight of **[22 oz./sq. yd. (746 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)]**.
 - a. Color: **[Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 - 2. Polyurethane-Coated Nylon Cover Fabric: Minimum total weight of **25 oz./sq. yd. (848 g/sq. m)**.
 - a. Color: **[Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
 - 3. Neoprene-Coated Nylon Cover Fabric: Minimum total weight of **[16 oz./sq. yd. (543 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)][45 oz./sq. yd. (1526 g/sq. m)]**.

- a. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
4. Hypalon-Coated Nylon Cover Fabric: Minimum total weight of [16 oz./sq. yd. (543 g/sq. m)][40 oz./sq. yd. (1356 g/sq. m)].
 - a. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
5. Cover Fabric: Manufacturer's proprietary cover fabric complying with the following minimum requirements:
 - a. Tearing strength of not less than [300 by 300 (1334 by 1334)]<Insert value> lbf (N) when tested according to ASTM D2261.
 - b. Abrasion resistance of not less than [6000]<Insert number> cycles when tested according to FED-STD-191A-5306.
 - c. Tensile strength of not less than [1200 by 1200 (5338 by 5338)]<Insert value> lbf (N) when tested according to FED-STD-191A-5100.1.
 - d. Cold resistance to minus 40 deg F (minus 40 deg C) when tested according to FED-STD-191A-5874.
 - e. Color: [Black][Green][Blue][Brown][Tan][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
6. Pleated Protectors: Same fabric as cover.
- G. Accessories:
 1. Buffer flaps.
 2. Bottom filler curtain.
 3. Bottom seal pads.

2.5 INFLATABLE LOADING DOCK SHELTERS

- A. Inflatable Dock Shelters: Inflatable dock shelters designed to inflate by blower and compress against truck bodies to form airtight seals at loading dock openings; of type, size, and construction indicated.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [air Locke Dock Seal]
 - b. [Kelley; Entrematic; ASSA ABLOY]
 - c. [Nordock Inc.]
 - d. [Pentalift Equipment Corporation]
 - e. [Rite-Hite Holding Corporation]
 - f. [Serco; Entrematic; ASSA ABLOY]
 - g. [Super Seal Mfg. Ltd]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [air Locke Dock Seal]
- b. [Kelley; Entrematic; ASSA ABLOY]
- c. [Nordock Inc.]
- d. [Pentalift Equipment Corporation]
- e. [Rite-Hite Holding Corporation]
- f. [Serco; Entrematic; ASSA ABLOY]
- g. [Super Seal Mfg. Ltd]
- h. <Insert manufacturer's name>

3. Source Limitations: Obtain from single source from single manufacturer.

- B. Rigid Canopy: Consisting of rigid canopy, fabric-covered header curtain, and one-piece inflatable header and jamb seals. Fabricate canopy from white, translucent plastic attached to rigid support framework.
- C. Rigid Canopy and Sides: Consisting of rigid canopy and sides, fabric-covered header curtain, and one-piece, inflatable header and jamb seals. Fabricate canopy and sides from white, translucent plastic attached to rigid support framework.
- D. Construction: Fabricate header seal full width over jamb seals. Mount seals on pressure-treated wood frame with hot-dip galvanized-steel mounting hardware. Provide header curtain with built-in flexible stays and two guide strips. Slope canopy frame from center for drainage. Provide two protective steel bumpers of size and type required for application shown. Inflate seals by use of a 1/2-hp motor/blower, mounted under canopy frame with separate manual on/off activation switch with indicator light.[**Provide electrical interlock.**] Provide bottom of header and jamb seals with grommets to allow for release of moisture and excess air.
 - 1. Shape and Size: Fabricate framework, fabric for curtains, and other components to sizes and shapes indicated or required to fit door-opening sizes shown, and allow for not less than **12 inches (305 mm)** of truck-body penetration when truck is docked.
 - 2. Wood Framework: Fasten members together mechanically, using nails and lag bolts or metal connectors to form a rigid assembly.
 - 3. Steel Framework: Zinc-plated steel tubing of size and thickness standard with manufacturer, with joints welded.
 - a. Steel Finish: Hot-dip galvanize components to comply with the following:
 - 1) ASTM A123/A123M for iron and steel support framing.
 - 2) ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.
 - 4. Guide Strips: **4-inch- (102-mm-)** wide, coated, nylon guide strips on header curtain.
- E. Materials:
 - 1. Fabric:
 - a. [Polyurethane][Vinyl]; minimum total weight of **14 oz./sq. yd. (475 g/sq. m)**.
 - 1) Color: [Black][Green][Blue][Brown][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - b. Manufacturer's proprietary fabric complying with the following minimum requirements:

- 1) Tearing strength of not less than [110 by 85 (489 by 378)]<Insert value> lbf (N) when tested according to ASTM D2261.
- 2) Abrasion resistance of not less than [490]<Insert number> cycles when tested according to FED-STD-191A-5306.
- 3) Tensile strength of not less than [500 by 440 (2224 by 1957)]<Insert value> lbf (N) when tested according to FED-STD-191A-5100.1.
- 4) Cold resistance to minus 40 deg F (minus 40 deg C) when tested according to FED-STD-191A-5874.
- 5) Color: [Black][Green][Blue][Brown][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

2.6 TRANSPARENT-STRIP DOOR CURTAINS

- A. Transparent-Strip Door Curtains: Door curtains consisting of overlapping strips suspended from top of opening to form a sealed door curtain. Provide strips of length required to suit opening height and with sufficient unit number to close opening width with overlap indicated.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Floor Products Company, Inc]
 - b. [Chalfant Sewing Fabricators, Inc]
 - c. [Chase Doors; a Senneca Company]
 - d. [Rotary Products Inc]
 - e. [Super Seal Mfg. Ltd]
 - f. [Verilon Vinyl]
 - g. [Vestil Manufacturing Company]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Floor Products Company, Inc]
 - b. [Chalfant Sewing Fabricators, Inc]
 - c. [Chase Doors; a Senneca Company]
 - d. [Rotary Products Inc]
 - e. [Super Seal Mfg. Ltd]
 - f. [Verilon Vinyl]
 - g. [Vestil Manufacturing Company]
 - h. <Insert manufacturer's name>
 3. Source Limitations: Obtain from single source from single manufacturer.
- B. Strip Material: Curved, clear, transparent, extruded PVC. Fabricate strips for manufacturer's standard method of attachment to overhead mounting system indicated.
1. Standard Grade: Designed to withstand temperature range of 0 to plus 150 deg F (minus 18 to plus 66 deg C).
 2. Low-Temperature Grade: USDA accepted; designed to withstand temperature range of minus 30 to plus 150 deg F (minus 34 to plus 66 deg C).

3. Strip Dimensions: [6 inches (152 mm) and 0.060 inch (1.5 mm)][8 inches (203 mm) and 0.080 inch (2 mm)][12 inches (305 mm) and 0.120 inch (3 mm)][16 inches (406 mm) and 0.160 inch (4 mm)] width and thickness, respectively.
4. Overlap: [None][One-third][One-half][Two-thirds][Three-quarters][Full].
- C. Header Mounting: Consisting of an angle bolted or welded to opening lintel; equip angle with permanently attached mounting pins and a steel-angle or -plate retaining strip attached to angle with wing nuts.
- D. Steel-Plate Wall Surface Mounting: Consisting of a steel plate bolted to side of lintel; equip plate with permanently attached, threaded, mounting pins and steel-angle or -plate retaining strip attached to plate with wing nuts.
- E. Steel-Pipe Wall Surface Mounting: Consisting of steel pipe attached to side of lintel by manufacturer's standard, winged-U-type suspension brackets.
- F. Wall Surface Mounting: Consisting of a rigid, vinyl, wall-mounting unit bolted to side of lintel above opening; equip unit with a similarly formed, rigid, vinyl retainer attached to unit with wing nuts.
- G. Wall Offset Mounting: Consisting of an angle bolted to face of wall projecting out on each side of door opening to allow hanging strips to clear overhead door hood. Equip angle with permanently attached mounting pins and a steel angle or plate retaining strip attached to angle with wing nuts. Return hanging strips to face of wall at jambs to fully enclose space interior to overhead door.
- H. Steel Finish: Hot-dip galvanize components to comply with the following:
 1. ASTM A123/A123M for iron and steel support mounting.
 2. ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical systems for inflatable units to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Coordinate electrical connections with Division 26 Sections.

3.3 INSTALLATION OF FOAM PAD LOADING DOCK SEALS

- A. Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.4 INSTALLATION OF LOADING DOCK SHELTERS

- A. Attach dock shelters securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure an effective seal of dock-shelter curtains with sides and top of truck body when trucks are positioned against dock bumpers.

3.5 INSTALLATION OF INFLATABLE LOADING DOCK SEALS

- A. Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.6 INSTALLATION OF FRAME-TYPE LOADING DOCK SHELTERS

- A. Attach dock shelters securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure an effective seal of dock-shelter curtains with sides and top of truck body when trucks are positioned against dock bumpers.

3.7 INSTALLATION OF INFLATABLE LOADING DOCK SHELTERS

- A. Attach dock shelters securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure an effective seal of dock-shelter curtains with sides and top of truck body when trucks are positioned against dock bumpers.

3.8 INSTALLATION OF TRANSPARENT-STRIP DOOR CURTAINS

- A. Attach door-curtain mounting system to lintel with screw anchors or toggle bolts. Mount curtain strips to overlap.

3.9 ADJUSTING

- A. After completing installation, inspect exposed factory finishes and repair damaged finishes.

END OF SECTION 11 13 16 00



Task	Specification	Specification Description
11 13 16 13	11 13 16 00	Loading Dock Seals and Shelters
11 13 16 23	11 13 16 00	Loading Dock Seals and Shelters



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SECTION 11 13 19 00 - STATIONARY LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Recessed loading dock levelers.
2. Edge-of-dock loading dock levelers.
3. Top-of-dock loading dock levelers.
4. Vertical-storing loading dock levelers.
5. Truck levelers.
6. Stationary loading dock lifts (scissor lifts).
7. Truck restraints.
8. Light communication systems.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for [**curb angles at edges of recessed pits**][and][**loading dock platform edge channels**].
2. Section 083323 "Overhead Coiling Doors" for coiling overhead doors electrically interlocked to dock levelers.
3. Section 083613 "Sectional Doors" for sectional overhead doors electrically interlocked to dock levelers.
4. Section 111313 "Loading Dock Bumpers" for loading dock bumpers that are not integral with loading dock levelers.
5. Section 111316 "Loading Dock Seals and Shelters" for loading dock seals and shelters.
6. Section 111323 "Portable Dock Equipment" for portable loading dock lifts.

1.2 DEFINITIONS

- A. Operating Range: Maximum amount of travel above and below the loading dock level.
- B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 COORDINATION

- A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation
- B. Coordinate installation of cast-in-place items. Furnish setting drawings and templates.
- C. Electrical System Roughing-in: Coordinate layout and installation of loading dock equipment with connections to power supplies[**and interlocked equipment**].

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
 - 2. Review sequence of operation for each type of loading dock equipment.
 - 3. Review coordination of interlocked equipment specified in this Section and elsewhere.
 - 4. Review required testing, inspecting, and certifying procedures.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stationary loading dock equipment.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For stationary loading dock equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Test Reports: For each dock leveler, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Indicate compliance of dock levelers with requirements in MH 30.1 for determining rated capacity based on comprehensive testing within last two years of current products.
 - 2. Submittal Form: According to MH 30.1.
- D. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stationary loading dock equipment to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Maintenance Proximity: Not more than **[one][two]<Insert number>** hours' normal travel time from Installer's place of business to Project site.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with stationary loading dock equipment, including **[recessed pit dimensions][slopes of driveways][and][heights of loading docks]**, by field measurements before fabrication.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
 - b. Faulty operation of operators, control system, or hardware.
 - c. Deck plate failures including cracked plate or permanent deformation in excess of **1/4 inch (6 mm)** between deck supports.
 - d. Hydraulic system failures including failure of hydraulic seals and cylinders.
 2. Warranty Period for Structural Assembly: **[10]<Insert number>** years from date of Substantial Completion.
 3. Warranty Period for Hydraulic System: **[Four][Five]<Insert number>** years from date of Substantial Completion.
 4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 RECESSED LOADING DOCK LEVELERS

- A. Recessed Loading Dock Levelers: Recessed, hinged-lip-type dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Beacon Industries, Inc]**
 - b. **[Blue Giant Equipment Corporation]**

- c. [Chalfant Sewing Fabricators, Inc]
- d. [DLM; Systems, LLC]
- e. [Kelley; Entrematic; ASSA ABLOY]
- f. [McGuire; Systems, LLC]
- g. [Nordock Inc.]
- h. [NOVA Technology International, L.L.C.]
- i. [Pentalift Equipment Corporation]
- j. [Pioneer Dock Equipment]
- k. [Poweramp; System, LLC]
- l. [Rite-Hite Holding Corporation]
- m. [Rotary Products Inc]
- n. [Serco; Entrematic; ASSA ABLOY]
- o. [Vestil Manufacturing Company]
- p. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Beacon Industries, Inc]
- b. [Blue Giant Equipment Corporation]
- c. [Chalfant Sewing Fabricators, Inc]
- d. [DLM; Systems, LLC]
- e. [Kelley; Entrematic; ASSA ABLOY]
- f. [McGuire; Systems, LLC]
- g. [Nordock Inc.]
- h. [NOVA Technology International, L.L.C.]
- i. [Pentalift Equipment Corporation]
- j. [Pioneer Dock Equipment]
- k. [Poweramp; System, LLC]
- l. [Rite-Hite Holding Corporation]
- m. [Rotary Products Inc]
- n. [Serco; Entrematic; ASSA ABLOY]
- o. [Vestil Manufacturing Company]
- p. <Insert manufacturer's name>

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Standard: Comply with MH 30.1[, **except for structural testing to establish rated capacity**].
- D. Rated Capacity: Capable of supporting total gross load of [20,000 (9072)][25,000 (11 340)][30,000 (13 608)][45,000 (20 412)]<Insert load> lb (kg) without permanent deflection or distortion.
- E. Platform: Not less than [3/16- (5-)][1/4- (6-)][3/8- (9.5-)]<Insert dimension> inch- (mm-) thick, nonskid steel plate.
 - 1. Platform Width: [72 inches (1829 mm)][78 inches (1981 mm)][84 inches (2134 mm)][**As indicated on Drawings**]<Insert dimension>
 - 2. Platform Length: [72 inches (1829 mm)][96 inches (2438 mm)][120 inches (3048 mm)][**As indicated on Drawings**]<Insert dimension>.
 - 3. Frame: [Manufacturer's standard][Clean-pit type, designed to support leveler at sides of pit, with no supports at front of pit floor].
 - 4. Toe Guards: Equip open sides of dock leveler over range indicated with steel toe guards.

- a. Toe-Guard Range: Entire upper **[operating][working]** range.
- F. Hinged Lip: Not less than **[1/2- (13-)][5/8- (16-)][3/4- (19-)][1- (25-)]<Insert dimension> inch- (mm-)** thick, nonskid steel plate.
1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube **[and grease fittings]**, with gussets on lip and ramp for support.
 2. Safety Barrier Lip: Designed to protect material-handling equipment from an accidental fall from loading platform edge of the dock leveler when the leveler is not in use.
- G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
 - a. Above Adjoining Platform: **[12 inches (305 mm)][18 inches (457 mm)][As indicated on Drawings]<Insert dimension>**.
 - b. Below Adjoining Platform: **[12 inches (305 mm)][14 inches (356 mm)][As indicated on Drawings]<Insert dimension>**.
 2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
 3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to **4 inches (102 mm)** over width of ramp.
 4. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
 - a. Length of Lip Extension: Not less than **12 inches (305 mm)** from face of dock bumpers and not less than) **[16 inches (406 mm)][18 inches (457 mm)][20 inches (508 mm)][dimension indicated on Drawings]<Insert dimension>** measured from ramp edge.
 5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs.
 6. Interlock: Leveler does not operate while **[overhead door is in closed position][leveler night lock is engaged][truck restraint is not engaged][inflatable dock seal is not inflated][and][inflatable dock shelter is not inflated]<Insert equipment and condition>**.
- H. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with an upward-biased-spring counterbalancing mechanism controlled by a hold-down device. Ramp raises to top limit of operating range by operating recessed control handle in ramp to disengage hold-down device. Ramp lowers below platform level with lip retracted by operating auxiliary, recessed control handle to release support legs.
1. Free-Fall Protection: Manufacturer's standard protection system to limit free fall of loaded ramps with front edge supported by truck bed.
- I. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity

fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than **3 inches (76 mm)**.

1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 4][Type 12]<Insert type>** box. Ramp raises by depressing and holding button; ramp lowers at a controlled rate by releasing button.
 2. Remote-Control Station with Emergency Stop: **[Weatherproof multibutton][Multibutton]** control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, **[Type 4][Type 12]<Insert type>** box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. Ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.
 - a. Dual-Panel Control Station: Remote-control station for operating side-by-side dock levelers.
 - b. Master Panel: Control panel with integral fused disconnecting means for operating dock leveler, dock door, and truck restraints.
 3. Independent Lip Operation: Electric-powered hydraulic raising and hydraulic lowering of lip, controlled independent of raising and lowering of ramp.
- J. Electric Operating System: Electric control from a remote-control station; motorized operation. Electric activation for raising of ramp and automatic extending of lip. Equip leveler with a packaged unit including a unitized electric motor and shaft assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers.
1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 4][Type 12]<Insert type>** box. Ramp raises by depressing and holding button; ramp lowers at a controlled rate by releasing button.
 2. Remote-Control Station with Emergency Stop: **[Weatherproof multibutton][Multibutton]** control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, **[Type 4][Type 12]<Insert type>** box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. Ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.
- K. Air-Bag Operating System: Electric control from a remote-control station; pneumatic operation. High-volume, low-pressure lifting of ramp. Equip leveler with a packaged unit including a PVC-coated, reinforced polyester lifting bag and two-stage, single-speed electric fan of proper size, type, and operation for capacity of leveler indicated. Include dock-leveler supports controlled by release chain for lowering ramp below platform level without extending lip.
1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 4]<Insert type>** box. Ramp raises by depressing and holding button; ramp lowers at a controlled rate by releasing button.
- L. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.

2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.
- M. Integral Molded-Rubber Dock Bumpers: Fabricated from [4- (102-)][6- (152-)]<Insert dimension> inch- (mm-) thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.
- N. Integral Laminated-Tread Dock Bumpers: Fabricated from [4-1/2- (114-)][6- (152-)]<Insert dimension> inch- (mm-) thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- (19-mm-) diameter, steel supporting rods that are welded at one end to 1/4-inch- (6-mm-) thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles.
- O. Materials:
 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).
 3. Steel Tubing: ASTM A500/A500M, cold formed.
 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- P. Dock-Leveler Finish: [Manufacturer's standard prime-paint or baked-on factory finish][Hot-dip galvanized][Spray zinc metallized]<Insert requirements>.
 1. Toe Guards: Baked-on factory finish.
- Q. Accessories:
 1. Curb Angles: 3-by-3-by-1/4-inch (76-by-76-by-6-mm) galvanized-steel curb angles for edge of recessed leveler pit, with 1/2-inch- (13-mm-) diameter by 6-inch- (152-mm-) long concrete anchors welded to angle at 6 inches (152 mm) o.c.
 2. Self-Forming Pan: Manufacturer's standard prefabricated, self-forming[spray zinc metallized] steel form system for poured-in-place construction of concrete pit.
 3. Night Locks: Manufacturer's standard means to prevent extending lip and lowering ramp when overhead doors are locked.
 4. Side and rear weatherseals.
 5. Foam insulation under dock-leveler platform.
 6. [Abrasive skid-resistant][Smooth] surface.

2.2 EDGE-OF-DOCK LOADING DOCK LEVELERS

- A. Edge-of-Dock Loading Levelers: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Beacon Industries, Inc]
 - b. [Blue Giant Equipment Corporation]

- c. [Bluff Manufacturing, Inc]
- d. [Chalfant Sewing Fabricators, Inc]
- e. [DLM; Systems, LLC]
- f. [Kelley; Entrematic; ASSA ABLOY]
- g. [McGuire; Systems, LLC]
- h. [Nordock Inc.]
- i. [NOVA Technology International, L.L.C.]
- j. [Pentalift Equipment Corporation]
- k. [Pioneer Dock Equipment]
- l. [Poweramp; System, LLC]
- m. [Rite-Hite Holding Corporation]
- n. [Rotary Products Inc]
- o. [Serco; Entrematic; ASSA ABLOY]
- p. [Vestil Manufacturing Company]
- q. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Beacon Industries, Inc]
- b. [Blue Giant Equipment Corporation]
- c. [Bluff Manufacturing, Inc]
- d. [Chalfant Sewing Fabricators, Inc]
- e. [DLM; Systems, LLC]
- f. [Kelley; Entrematic; ASSA ABLOY]
- g. [McGuire; Systems, LLC]
- h. [Nordock Inc.]
- i. [NOVA Technology International, L.L.C.]
- j. [Pentalift Equipment Corporation]
- k. [Pioneer Dock Equipment]
- l. [Poweramp; System, LLC]
- m. [Rite-Hite Holding Corporation]
- n. [Rotary Products Inc]
- o. [Serco; Entrematic; ASSA ABLOY]
- p. [Vestil Manufacturing Company]
- q. <Insert manufacturer's name>

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Standard: Comply with MH 30.1[, **except for structural testing to establish rated capacity**].
- D. Rated Capacity: Capable of supporting total gross load of [20,000 (9072)][25,000 (11 340)][30,000 (13 608)]<Insert load> lb (kg) without permanent deflection or distortion.
- E. Platform Ramp Width: [66 inches (1676 mm)][72 inches (1829 mm)][78 inches (1981 mm)][84 inches (2134 mm)][As indicated on Drawings]<Insert dimension>.
- F. Hinged Lip: Not less than [3/8- (9.5-)][7/16- (11-)][1/2- (13-)]<Insert dimension> inch- (mm-) thick, nonskid steel tread plate.
 - 1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube[**and grease fittings**], with gussets on lip and ramp for support.

- G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
 - a. Above Adjoining Platform: **[5 inches (127 mm)][6 inches (152 mm)][As indicated on Drawings]<Insert dimension>**.
 - b. Below Adjoining Platform: **[5 inches (127 mm)][As indicated on Drawings]<Insert dimension>**.
 2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
 3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to **3 inches (76 mm)** over width of ramp.
 4. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
 - a. Length of Lip Extension: Not less than **12 inches (305 mm)** from face of dock bumpers and not less than **[15 inches (381 mm)][17 inches (432 mm)][dimension indicated on Drawings]<Insert dimension>** measured from ramp edge.
 5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs. Leveler shall be capable of retracting to stored position while truck is at loading dock.
- H. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.
1. Lever Handle: Self-storing lever handle for raising unloaded ramp with minimal lifting force by pulling lever back to extend lip and pushing lever forward to lower ramp and lip.
 2. Removable Lifting Handle: For raising unloaded ramp by lifting action.
- I. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than **3 inches (76 mm)**.
1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 4][Type 12]<Insert type>** box. Ramp and lip raise to vertical position and extend to truck bed by depressing and holding button.
- J. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
 2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of

dock leveler.

- K. Integral Molded-Rubber Dock Bumpers: Fabricated from [4- (102-)][6- (152-)]<Insert dimension> inch- (mm-) thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.
- L. Integral Laminated-Tread Dock Bumper: Fabricated from [4-1/2- (114-)][6- (152-)]<Insert dimension> inch- (mm-) thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- (19-mm-) diameter, steel supporting rods that are welded at one end to 1/4-inch- (6-mm-) thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles.
- M. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).
 - 3. Steel Tubing: ASTM A500/A500M, cold formed.
 - 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- N. Dock-Leveler Finish: [Manufacturer's standard prime-paint or baked-on factory finish][Hot-dip galvanized][Spray zinc metallized]<Insert requirements>.
- O. Accessories:
 - 1. Self-forming pan.
 - 2. Cast-in-place design.
 - 3. Run-off guards.
 - 4. Ramp approach plate.
 - 5. [Interlock to truck restraint][Key switch].

2.3 TOP-OF-DOCK LOADING DOCK LEVELERS

- A. Top-of-Dock Loading Dock Levelers: Surface-mounted, hinged-lip-type, top-of-dock levelers designed for permanent installation on top edge of loading dock platform without concrete pit; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Beacon Industries, Inc]
 - b. [DLM; Systems, LLC]
 - c. [Pioneer Dock Equipment]
 - d. [Rotary Products Inc]
 - e. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. **[Beacon Industries, Inc]**
 - b. **[DLM; Systems, LLC]**
 - c. **[Pioneer Dock Equipment]**
 - d. **[Rotary Products Inc]**
 - e. **<Insert manufacturer's name>**
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Standard: Comply with MH 30.1[, **except for structural testing to establish rated capacity**].
- D. Rated Capacity: Capable of supporting total gross load of **[20,000 (9072)][25,000 (11 340)]<Insert load> lb (kg)** without permanent deflection or distortion.
- E. Platform Width: **[72 inches (1829 mm)][As indicated on Drawings]<Insert dimension>**.
- F. Hinged Lip: Not less than **[3/8- (9.5-)][7/16- (11-)]<Insert dimension> inch- (mm-)** thick, nonskid steel plate.
1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube[**and grease fittings**], with gussets on lip and ramp for support.
- G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with a minimum working range of **[10 (254)]<Insert dimension> inches (mm)** above and **[4 (102)]<Insert dimension> inches (mm)** below adjoining platform level.
 2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
 3. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
 - a. Length of Lip Extension: Not less than **12 inches (305 mm)** from face of dock bumpers and not less than **[15 inches (381 mm)][dimension indicated on Drawings]<Insert dimension>** measured from ramp edge.
 4. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs. Leveler shall be capable of retracting to stored position while truck is at loading dock.
- H. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.
1. Removable Lifting Hook: For raising unloaded ramp by lifting action and pushing forward to lower ramp and lip.
- I. Hydraulic Operating System: Electric control from a remote-control station, fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve

assembly of proper size, type, and operation for capacity of leveler indicated.

1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 12]<Insert type>** box. Ramp and lip raise to vertical position and extend to truck bed by depressing and holding button.
- J. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
- K. Integral Molded-Rubber Dock Bumpers: Fabricated from **[4- (102-)][6- (152-)]<Insert dimension> inch- (mm-)** thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.
- L. Integral Laminated-Tread Dock Bumpers: Fabricated from **[4-1/2- (114-)][6- (152-)]<Insert dimension> inch- (mm-)** thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two **3/4-inch- (19-mm-)** diameter, steel supporting rods that are welded at one end to **1/4-inch- (6-mm-)** thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than **1 inch (25 mm)** of tread plies extending beyond the face of closure angles.
- M. Materials:
 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
 3. Steel Tubing: ASTM A500/A500M, cold formed.
 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- N. Dock-Leveler Finish: **[Manufacturer's standard prime-paint or baked-on factory finish][Hot-dip galvanized][Spray zinc metallized]<Insert requirements>**.

2.4 VERTICAL-STORING LOADING DOCK LEVELERS

- A. Vertical-Storing Loading Dock Levelers: Recessed, hinged-lip-type, vertical-storing dock levelers designed for permanent installation in shallow concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Blue Giant Equipment Corporation]**
 - b. **[Kelley; Entrematic; ASSA ABLOY]**
 - c. **[McGuire; Systems, LLC]**
 - d. **[Pentalift Equipment Corporation]**
 - e. **[Poweramp; System, LLC]**
 - f. **[Rite-Hite Holding Corporation]**
 - g. **[Serco; Entrematic; ASSA ABLOY]**

- h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Blue Giant Equipment Corporation]
 - b. [Kelley; Entrematic; ASSA ABLOY]
 - c. [McGuire; Systems, LLC]
 - d. [Pentalift Equipment Corporation]
 - e. [Poweramp; System, LLC]
 - f. [Rite-Hite Holding Corporation]
 - g. [Serco; Entrematic; ASSA ABLOY]
 - h. <Insert manufacturer's name>
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Standard: Comply with MH 30.1[, **except for structural testing to establish rated capacity**].
 - D. Rated Capacity: Capable of supporting total gross load of [40,000 (18 144)][45,000 (20 412)][50,000 (22 680)]<Insert load> lb (kg) without permanent deflection or distortion.
 - E. Platform: Not less than [3/16- (5-)][1/4- (6-)]<Insert dimension> inch- (mm-) thick, nonskid steel plate.
 1. Platform Width: [72 inches (1829 mm)][84 inches (2134 mm)][As indicated on Drawings]<Insert dimension>.
 2. Platform Length: [60 inches (1524 mm)][72 inches (1829 mm)][96 inches (2438 mm)][As indicated on Drawings]<Insert dimension>.
 - F. Hinged Lip: Not less than [1/2- (13-)][5/8- (16-)]<Insert dimension> inch- (mm-) thick, nonskid steel plate.
 1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube[**and grease fittings**], with gussets on lip and ramp for support.
 - G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
 1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
 - a. Above Adjoining Platform: [6 inches (152 mm)][10 inches (254 mm)][12 inches (305 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Below Adjoining Platform: [6 inches (152 mm)][As indicated on Drawings]<Insert dimension>.
 2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
 3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 4 inches (102 mm) over width of ramp.
 4. Lip Operation: Manufacturer's standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.

- a. Length of Lip Extension: Not less than **12 inches (305 mm)** from face of dock bumpers and not less than **[16 inches (406 mm)][18 inches (457 mm)][20 inches (508 mm)][dimension indicated on Drawings]<Insert dimension>** measured from ramp edge.
- H. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than **3 inches (76 mm)**. Provide mechanical lock that prevents leveler from lowering without hydraulic pressure.
1. Remote-Control Station: **[Weatherproof single][Single]**-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 12]<Insert type>** box. Ramp lowers at a controlled rate.
 2. Remote-Control Station with Emergency Stop: **[Weatherproof multibutton][Multibutton]** control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, **[Type 12]<Insert type>** box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. Ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.
- a. Master Panel: Control panel with integral fused disconnecting means for operating dock leveler, dock door, and truck restraints.
3. Independent Lip Operation: Electric-powered hydraulic raising and lowering of lip, controlled independent of raising and lowering of ramp.
- I. Construction: Fabricate dock-leveler frame, platform supports, **[run-off guards,]** and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
- J. Integral Molded-Rubber Dock Bumpers: Fabricated from **[4- (102-)][6- (152-)]<Insert dimension> inch-(mm-)** thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.
- K. Integral Laminated-Tread Dock Bumpers: Fabricated from **[4-1/2- (114-)][6- (152-)]<Insert dimension> inch- (mm-)** thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two **3/4-inch- (19-mm-)** diameter, steel supporting rods that are welded at one end to **1/4-inch- (6-mm-)** thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than **1 inch (25 mm)** of tread plies extending beyond the face of closure angles.
- L. Materials:
1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
 3. Steel Tubing: ASTM A500/A500M, cold formed.
 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- M. Dock-Leveler Finish: **[Manufacturer's standard prime-paint or baked-on factory finish][Hot-dip**

galvanized][Spray zinc metallized]<Insert requirements>.

N. Accessories:

1. Interlock: Leveler does not operate while **[overhead door is in closed position][and][truck restraint is not engaged]**.
2. Curb Angles: **3-by-3-by-1/4-inch (76-by-76-by-6-mm)** galvanized-steel curb angles for edge of recessed leveler pit, with **1/2-inch- (13-mm-)** diameter by **6-inch- (152-mm-)** long concrete anchors welded to angle at **6 inches (152 mm)** o.c.

2.5 TRUCK LEVELERS

A. Truck Levelers: Two-cylinder, hydraulic ramp designed to raise and lower end of truck at loading dock. Equip leveler with a packaged unit including a unitized electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity indicated. Provide manufacturer's standard means for limiting loaded ramp's free fall.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Kelley; Entrematic; ASSA ABLOY]**
 - e. **[Pentalift Equipment Corporation]**
 - f. **[Poweramp; System, LLC]**
 - g. **[Rite-Hite Holding Corporation]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Kelley; Entrematic; ASSA ABLOY]**
 - e. **[Pentalift Equipment Corporation]**
 - f. **[Poweramp; System, LLC]**
 - g. **[Rite-Hite Holding Corporation]**
 - h. **<Insert manufacturer's name>**

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Rated Capacity: Capable of supporting total gross load of **[50,000 (22 680)][55,000 (24 948)][60,000 (27 216)][65,000 (29 484)]<Insert load> lb (kg)** without permanent deflection or distortion.

D. Travel Speed: Leveler raises and lowers at **3 fpm (0.015 m/s)**, measured at traveling end.

E. Surface-Mounted Units: Designed for mounting on surface of concrete driveway.

F. Shallow-Pit-Mounted Units: Designed for mounting in sloping shallow pit; capable of **18 inches (457**

mm) of vertical travel above and below level of driveway.

- G. Full-Pit-Mounted Units: Designed for installation in a fully recessed pit, with top of platform in stored position flush with driveway.
 - 1. Provide removable plate for access to pit for service.
- H. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Self-contained, electric-powered hydraulic raising and hydraulic lowering of lift.
 - 1. Remote-Control Station: Weatherproof, multibutton control station of the constant-pressure type with UP and DOWN push buttons. Controller shall consist of magnetic motor starter with three-pole adjustable overloads and 24-V control transformer with 4-A, fused secondary prewired to terminal strips and enclosed in NEMA ICS 6, **[Type 12]<Insert type>** box.
 - a. Upper-Travel-Limit Switch: Equip unit with manufacturer's standard, adjustable, upper-travel-limit switch.
- I. Construction: Fabricate truck leveler from structural- and formed-steel shapes; fabricate platform from nonskid steel plate. Construct platform with notch at loading dock end to provide clearance for truck restraint.
 - 1. Cylinders: Equip truck leveler with not less than two heavy-duty, high-pressure, hydraulic, ram-type cylinders. Rams shall be manufacturer's standard, either direct-displacement plunger or rod-and-piston type with positive internal stops. Cylinder rods shall be chrome plated and polished.
- J. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
 - 3. Steel Tubing: ASTM A500/A500M, cold formed.
 - 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- K. Truck-Leveler Finish: **[Manufacturer's standard prime-paint or baked-on factory finish][Hot-dip galvanized]<Insert requirements>**.

2.6 STATIONARY LOADING DOCK LIFTS

- A. Stationary Loading Dock Lifts: Stationary, scissors-type, single-leg, hydraulic dock lift of capacity, size, and construction indicated; complete with controls, safety devices, and accessories required.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Blue Giant Equipment Corporation]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[Pentalift Equipment Corporation]**

- g. **[Presto Lifts Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Blue Giant Equipment Corporation]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[Pentalift Equipment Corporation]**
 - g. **[Presto Lifts Inc.]**
 - h. **<Insert manufacturer's name>**
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Standard: MH 29.1.
 - D. Rated Capacity: Lifting capacity of not less than **[8000 lb (3629)] [load indicated on Drawings] <Insert requirements>** with axle loads of **[6500 lb (2948 kg) at ends and 5000 lb (2268 kg) at sides] [magnitudes indicated on Drawings] <Insert requirements>**.
 - E. Platform: **[Nonskid, safety-tread] [Smooth-surface]** heavy **[hot-dip galvanized-]** steel deck plate.
 1. Platform Size: **[72 inches (1829 mm) long by 72 inches (1829 mm) wide] [96 inches (2438 mm) long by 72 inches (1829 mm) wide] [120 inches (3048 mm) long by 72 inches (1829 mm) wide] [As indicated on Drawings] <Insert size>**.
 2. Platform Guarding: **[Bevel toe guards] [Toe sensor] [Indicator bar] [Skirts] [Enclosure]** to comply with requirements in MH 29.1.
 3. **[Removable] [Fixed]** Guard Rails: Provide **[steel] [hot-dip galvanized-steel] [aluminum]** guard rails on two sides of platform with a single, removable chain across each end. Provide guard rails not less than **39 inches (991 mm)** high with midrail and **4-inch- (102-mm-)** high, kick plate at bottom. **[Mount rail sockets flush with platform surface.]**
 - F. Bridge: **[Nonskid, safety-tread steel] [Nonskid, safety-tread, hot-dip galvanized-steel] [High-tensile aluminum]** plate.
 1. Hinged Bridge: Hinged, throw-over bridge bolted to full-length, heavy-duty, piano-type hinge welded to toe guard at end of platform. Provide bridge complete with heavy-duty lifting chains. Chamfer edge of bridge to minimize obstructing wheels of material-handling vehicles.
 2. Size: **[18 inches (457 mm) long by 60 inches (1524 mm) wide] [18 inches (457 mm) long by 72 inches (1829 mm) wide] [As indicated on Drawings] <Insert size>**.
 3. Locations: **[Ends] [Sides] [As indicated on Drawings]**.
 - G. Function: Dock lifts shall compensate for differences in height between truck bed and loading platform.
 1. Vertical Travel and Travel Speed: As indicated on Drawings.
 2. Vertical Travel: Maximum of **[60 (1524)] <Insert dimension> inches (mm)** from a lowered height of **[12 (305)] <Insert dimension> inches (mm)** for a total raised height of **[72 (1829)] <Insert dimension> inches (mm)**.
 3. Travel Speed: Nominal raising speed of **[8 (0.04)] [10 (0.05)] [12 (0.06)] <Insert speed> fpm (m/s)**.
 4. Hinged Throw-over Bridge Operation: **[Manual] [Spring assist] [Manual-assist bridge winch] [Automatic powered]**.

- H. Hydraulic Operating System: Self-contained, electric, hydraulic power unit for raising and lowering lift; of size, type, and operation needed for capacity of lift indicated; controlled from a remotely located push-button station.
 - 1. Power Unit: Consisting of continuous-duty motor, high-pressure gear pump, valve manifold, oil-line filters, and oil reservoir.
 - a. Equip manifold with relief valve, check valve, pressure-compensated flow-control valve, and solenoid valve and with provisions for lowering lift manually if power fails.
 - b. Equip reservoir, valve manifold, and pressure line with oil-line filters.
 - 2. Cylinders: Equip lift with not less than two heavy-duty, high-pressure, hydraulic, ram-type cylinders. Rams shall be manufacturer's standard, either direct-displacement-plunger or rod-and-piston type with positive internal stops. Cylinder rods shall be chrome plated and polished.
 - a. Rate of Descent Protection: Pressure-compensated flow control or hydraulic velocity fuse to limit down speed for each cylinder.
 - 3. Remote-Control Station: Multibutton control station of the constant-pressure type with UP and DOWN push buttons. Controller shall consist of magnetic motor starter with three-pole adjustable overloads and 24-V control transformer with 4-A, fused secondary prewired to terminal strips and enclosed in NEMA ICS 6, [Type 12]<Insert type> box.
 - a. Upper-Travel-Limit Switch: Equip unit with manufacturer's standard, adjustable, upper-travel-limit switch.
- I. Construction: Fabricate lift from structural-steel shapes rigidly welded and reinforced for maximum strength, safety, and stability. Design assembly to withstand deformation during both operating and stored phases of service. Provide mounting brackets and removable lifting eyes for ease of installation.
 - 1. Scissors Mechanism: Fabricate leg members from heavy, [hot-dip galvanized-] steel-formed tube or plate members to provide maximum strength and rigidity.
 - 2. Scissors Configuration: [Single leg][Multiple width][Multiple length].
 - 3. Bearings: Pivot points with permanently lubricated antifriction bushings or sealed ball-bearings for minimum maintenance.
 - 4. Maintenance Leg: Removable, safety maintenance leg or hinged, safety maintenance bars.
 - 5. Mounting: [Surface][Pit].
- J. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).
 - 3. Steel Tubing: ASTM A500/A500M, cold formed.
- K. Dock Lift Finish: Manufacturer's standard baked-on factory finish unless otherwise indicated.

2.7 TRUCK RESTRAINTS

- A. Truck Restraints: Manufacturer's standard device designed to engage truck's rear-impact guard and hold truck at loading dock. Restraint shall consist of an iron or steel restraining arm that raises until contacting rear-impact guard. Arm shall move vertically, automatically adjusting to varying height of truck due to loading and unloading operations.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Beacon Industries, Inc]
 - b. [Blue Giant Equipment Corporation]
 - c. [Chalfant Sewing Fabricators, Inc]
 - d. [DLM; Systems, LLC]
 - e. [Kelley; Entrematic; ASSA ABLOY]
 - f. [McGuire; Systems, LLC]
 - g. [Nordock Inc.]
 - h. [NOVA Technology International, L.L.C.]
 - i. [Pentalift Equipment Corporation]
 - j. [Pioneer Dock Equipment]
 - k. [Poweramp; System, LLC]
 - l. [Rite-Hite Holding Corporation]
 - m. [Rotary Products Inc]
 - n. [Serco; Entrematic; ASSA ABLOY]
 - o. [Vestil Manufacturing Company]
 - p. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Beacon Industries, Inc]
 - b. [Blue Giant Equipment Corporation]
 - c. [Chalfant Sewing Fabricators, Inc]
 - d. [DLM; Systems, LLC]
 - e. [Kelley; Entrematic; ASSA ABLOY]
 - f. [McGuire; Systems, LLC]
 - g. [Nordock Inc.]
 - h. [NOVA Technology International, L.L.C.]
 - i. [Pentalift Equipment Corporation]
 - j. [Pioneer Dock Equipment]
 - k. [Poweramp; System, LLC]
 - l. [Rite-Hite Holding Corporation]
 - m. [Rotary Products Inc]
 - n. [Serco; Entrematic; ASSA ABLOY]
 - o. [Vestil Manufacturing Company]
 - p. <Insert manufacturer's name>
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Standard: Comply with MH 30.3.
- D. Rated Capacity: Capable of supporting total gross load of [30,000 (13 608)][32,000 (14 515)]<Insert load> lb (kg) without permanent deflection or distortion.
- E. Operating Range: Capable of restraining rear-impact guards within a range from:
1. Vertical Range: Minimum of [7 inches (178 mm)][8 inches (203 mm)][9 inches (229 mm)][11 inches (279 mm)][dimension indicated on Drawings]<Insert dimension> to maximum of [28 inches (711 mm)][30 inches (762 mm)][34 inches (864 mm)][dimension indicated on

- Drawings]**<Insert dimension> above driveway.
2. Horizontal Range: Zero to **[10 inches (254 mm)]****[12 inches (305 mm)]****[15 inches (381 mm)]****[dimension indicated on Drawings]**<Insert dimension> in front of dock bumpers.
- F. Power Operating System: Manufacturer's standard electromechanical or hydraulic unit.
1. Remote-Control Station: Single-button station of the constant-pressure type, enclosed in NEMA ICS 6, **[Type 12]**<Insert type> box. Restraint is engaged by depressing and holding button; restraint is released by releasing button.
 2. Interlock: Leveler does not operate while truck restraint is not engaged.
- G. Mechanical Operating System: Restraint operates by use of a lifting rod or hook to raise engagement device.
- H. Rear-Impact-Guard Sensor: Detects presence of rear-impact guard **[and automatically returns to stored position if rear-impact guard is not engaged]**.
- I. Caution Signs: Exterior, surface mounted; designed to inform both dock attendant and truck driver; with sign copy as follows. Provide one sign at each truck-restraint location.
1. Sign Copy in Forward and Reverse Text: **[Manufacturer's standard text permitting truck movement with green light]**<Insert text>.
 2. Interior Sign Copy: **[Manufacturer's standard text permitting truck movement with green light]**<Insert text>.
- J. Light Communication System: Red and green illuminated signal-light sets, with lens approximately **4 inches (102 mm)** in diameter, designed to indicate status to both dock attendant and truck driver. Equip system with steel control panel located at interior of dock that **[includes illuminated lights indicating]****[indicates]** status of exterior signal lights. Provide signal-light set and control panel at each location indicated for light communication system. Enclose exterior signal-light sets in steel or plastic housing with sunshade.
1. Manual Operation: System is activated by push button or switch located on **[interior]****[truck-restraint]** control panel.
 2. Automatic Operation:
 - a. System is activated automatically by **[limit switch]****[photoelectric sensor]****[magnetic switch]** mounted on overhead door track. Provide on-off switch located on **[light communication system]****[truck-restraint]** control panel.
 - b. System is activated automatically when device engages rear-impact guard. Provide on-off switch located on truck-restraint control panel.
 3. Mounting: **[Wall]****[Driveway]****[Pit]****[Pedestal]**.
 - a. Pedestal: **4 by 4 inches (102 by 102 mm) post with base plate and face plate for mounting light communication system,**60 inches (1524 mm) high.)
 - 1) Finish: **[Manufacturer's standard baked-on factory finish in yellow or orange]****[Hot-dip galvanized]**.
- K. Alarm: **[Audible]****[and]****[visual]** system indicating that rear-impact guard is not engaged, with manual reset.
- L. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
3. Steel Tubing: ASTM A500/A500M, cold formed.
4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

M. Truck-Restraint Finish: **[Manufacturer's standard electrodeposited zinc coating][Hot-dip galvanized]**.

N. Accessories: **[Interlock to dock leveler][Key switch]**.

2.8 LIGHT COMMUNICATION SYSTEMS

A. Light Communication Systems: Communication system consisting of signal-light sets, caution signs, alarms, and controls for each location indicated.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Beacon Industries, Inc]**
 - b. **[Kelley; Entrematic; ASSA ABLOY]**
 - c. **[Nordock Inc.]**
 - d. **[Rite-Hite Holding Corporation]**
 - e. **[Serco; Entrematic; ASSA ABLOY]**
 - f. **[Vestil Manufacturing Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Beacon Industries, Inc]**
 - b. **[Kelley; Entrematic; ASSA ABLOY]**
 - c. **[Nordock Inc.]**
 - d. **[Rite-Hite Holding Corporation]**
 - e. **[Serco; Entrematic; ASSA ABLOY]**
 - f. **[Vestil Manufacturing Company]**
 - g. **<Insert manufacturer's name>**

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Caution Signs: Surface mounted; designed to inform both dock attendant and truck driver; with sign copy as follows:

1. Exterior Sign Copy in Forward and Reverse Text: **[Manufacturer's standard text permitting truck movement with green light]<Insert text>**.
2. Interior Sign Copy: **[Manufacturer's standard text permitting truck movement with green light]<Insert text>**.
3. Mounting: **[Wall][Pedestal]**

D. Signal-Light Sets: Red and green illuminated signal-light sets, with lens approximately **4 inches (102**



mm) in diameter, designed to indicate status to both dock attendant and truck driver. Equip system with steel control panel that **[includes illuminated lights indicating][indicates]** status of exterior signal lights; locate control panel at interior of dock. Provide signal-light set and control panel at each location indicated for light communication system. Enclose signal lights in steel or plastic housing, with exterior signal-light sets equipped with sunshade.

1. Manual Operation: Lights are activated by push button or switch located on **[interior signal-light enclosure][control panel]**.
2. Automatic Operation: Lights are activated automatically by **[limit switch][photoelectric sensor][magnetic switch]** mounted on overhead door track. Provide on-off switch located on control panel.
3. Mounting: **[Wall][Pedestal]**

E. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
3. Steel Tubing: ASTM A500/A500M, cold formed.
4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.9 FINISH REQUIREMENTS

- A. Finish loading dock equipment after assembly and testing.
- B. Hot-Dip Galvanizing: Comply with the following:
 1. ASTM A123/A123M for iron and steel loading dock equipment.
 2. ASTM A153/A153M or ASTM F2329/F2329M for iron and steel hardware for loading dock equipment.
- C. Spray Zinc Metallizing: ASTM B833.
- D. Electrodeposited Zinc Coatings: ASTM B633.
- E. Steel Prime Paint Finish: Clean, pretreat, and apply manufacturer's standard primer.
- F. Baked-on Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 1. Color: **[Manufacturer's standard][Match Architect's sample]<Insert color>**.
 2. Toe Guards: Paint to comply with ANSI Z535.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.
- C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.
- B. Set curb angles in concrete edges of truck-leveler recessed pits with tops flush with driveway. Fit exposed connections together to form hairline joints.
- C. Place self-forming pan system for **[recessed dock]****[edge-of-dock]** levelers in proper relation to loading platform before pouring concrete.
- D. Clean recessed pits of debris.

3.3 INSTALLATION, GENERAL

- A. Install loading dock equipment as required for a complete installation.
 - 1. Rough-in electrical connections.

3.4 INSTALLATION OF RECESSED LOADING DOCK LEVELERS

- A. Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.

3.5 INSTALLATION OF EDGE-OF-DOCK LOADING DOCK LEVELERS

- A. Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.
 - 1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

3.6 INSTALLATION OF TOP-OF-DOCK LOADING DOCK LEVELERS

- A. Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.
 - 1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

3.7 INSTALLATION OF TRUCK LEVELERS

- A. Attach truck levelers securely to driveway construction with expansion anchors and bolts.

3.8 INSTALLATION OF STATIONARY LOADING DOCK LIFTS

- A. Attach dock lifts securely to **[loading platform][floor of recessed pit][surface of driveway]**.

3.9 INSTALLATION OF TRUCK RESTRAINTS

- A. Attach truck restraints in a manner that complies with requirements for arrangement and height required for device to engage vehicle rear-impact guard. **[Interconnect control panel and signals with dock leveler.]**
 - 1. Wall-Mounted Units: **[Weld][Anchor]**
 - a. Weld truck restraints to steel **[curb angle][edge channel][mounting plate]** embedded in loading dock edge.
 - b. Anchor truck restraints to face of loading dock with expansion anchors and bolts.
 - 2. Driveway-Mounted Units: Anchor truck restraints to driveway with expansion anchors and bolts.
 - 3. Pit-Mounted Units: Anchor truck restraints to concrete pit with expansion anchors and bolts.

3.10 ADJUSTING

- A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.
- B. Test dock levelers for vertical travel and adjust to maintain operating range indicated.
- C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.11 MAINTENANCE SERVICE

- A. Beginning at Substantial Completion, maintenance service shall include **[12]<Insert number>** months' full maintenance by skilled employees of loading dock equipment Installer. Include **[monthly][quarterly]** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper loading dock equipment operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.12 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 11 13 19 00



Task	Specification	Specification Description
11 13 19 13	11 13 19 00	Stationary Loading Dock Equipment
11 13 19 23	11 13 19 00	Stationary Loading Dock Equipment
11 13 19 26	11 13 19 00	Stationary Loading Dock Equipment
11 13 19 33	11 13 19 00	Stationary Loading Dock Equipment



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SECTION 11 13 23 00 - PORTABLE DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable loading dock lifts (scissors lifts).
- B. Related Requirements:
 - 1. Section 111319 "Stationary Loading Dock Equipment" for stationary dock lifts (scissor lifts).

1.2 DEFINITIONS

- A. Operating Range: Maximum amount of travel above and below the loading dock level.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
 - 2. Review sequence of operation for each type of portable dock equipment.
 - 3. Review coordination of interlocked equipment specified in this Section and elsewhere.
 - 4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For portable dock equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For portable dock equipment, to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PORTABLE LOADING DOCK LIFTS (SCISSOR LIFTS)

- A. Dock Lifts: Portable, scissors-type, single-leg, hydraulic dock lift of capacity, size, and construction indicated; complete with controls, safety devices, and accessories required.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Blue Giant Equipment Corporation]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[Pentalift Equipment Corporation]**
 - g. **[Presto Lifts Inc.]**
 - h. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Lifts, Inc]**
 - b. **[Autoquip Corporation]**
 - c. **[Beacon Industries, Inc]**
 - d. **[Blue Giant Equipment Corporation]**
 - e. **[Kelley; Entrematic; ASSA ABLOY]**
 - f. **[Pentalift Equipment Corporation]**
 - g. **[Presto Lifts Inc.]**
 - h. **<Insert manufacturer's name>**
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Standard: MH 29.1.
- D. Rated Capacity: Lifting capacity of not less than **[8000 lb (3629 kg)][load indicated on Drawings]<Insert requirements>** and with axle loads of **[6500 lb (2948 kg) at ends and 5000 lb (2268 kg) at sides][magnitudes indicated on Drawings]<Insert requirements>**.

- E. Platform: **[Nonskid, safety-tread][Smooth-surface]** heavy **[hot-dip galvanized-]** steel deck plate.
1. Platform Size: **[72 inches (1829 mm) wide by 72 inches (1829 mm) long][72 inches (1829 mm) wideby 96 inches (2438 mm) long][72 inches (1829 mm) wideby 120 inches (3048 mm) long][As indicated on Drawings]<Insert size>.**
 2. Platform Guarding: **[Bevel toe guards][Toe sensor][Indicator bar][Skirts][Enclosure]** to comply with requirements in MH 29.1.
 3. **[Removable][Fixed]** Guard Rails: Provide **[steel][hot-dip galvanized-steel][aluminum]** guard rails on two sides of platform with a single, removable chain across each end. Provide guard rails not less than **39 inches (991 mm)** high with midrail and **4-inch- (102-mm-)** high, kick plate at bottom. **[Mount rail sockets flush with platform surface.]**
- F. Bridge: **[Nonskid, safety-tread steel][Nonskid, safety-tread hot-dip galvanized-steel][High-tensile aluminum]** plate.
1. Hinged Bridge: Hinged, throw-over bridge bolted to full-length, heavy-duty, piano-type hinge welded to toe guard at end of platform. Provide bridge complete with heavy-duty lifting chains. Chamfer edge of bridge to minimize obstructing wheels of material-handling vehicles.
 2. Size: **[18 inches (457 mm) long by 60 inches (1524 mm) wide][18 inches (457 mm) long by 72 inches (1829 mm) wide][As indicated on Drawings]<Insert size>.**
 3. Locations: **[Ends][Sides][As indicated on Drawings].**
- G. Function: Dock lifts shall compensate for differences in height between truck bed and loading platform.
1. Vertical Travel and Travel Speed: As indicated on Drawings.
 2. Vertical Travel: Maximum of **[60 (1524)]<Insert dimension> inches (mm)** from a lowered height of **[12 (305)]<Insert dimension> inches (mm)** for a total raised height of **[72 (1829)]<Insert dimension>inches (mm).**
 3. Travel Speed: Nominal raising speed of **[8 (0.04)][10 (0.05)][12 (0.06)]<Insert speed>fpm (m/s).**
 4. Hinged Throw-over Bridge Operation: **[Manual][Spring assist][Manual-assist bridge winch][Automatic powered].**
- H. Hydraulic Operating System: Self-contained, electric, hydraulic power unit for raising and lowering lift; of size, type, and operation needed for capacity of lift indicated; controlled from a remotely located push-button station.
1. Power Unit: Consisting of continuous-duty motor, high-pressure gear pump, valve manifold, oil-line filters, and oil reservoir.
 - a. Equip manifold with relief valve, check valve, pressure-compensated flow-control valve, and solenoid valve and with provisions for lowering lift manually if power fails.
 - b. Equip reservoir, valve manifold, and pressure line with oil-line filters.
 2. Cylinders: Equip lift with not less than two heavy-duty, high-pressure, hydraulic, ram-type cylinders. Rams shall be manufacturer's standard, either direct-displacement plunger or rod-and-piston type with positive internal stops. Cylinder rods shall be chrome plated and polished.
 - a. Rate of Descent Protection: Pressure-compensated flow control or hydraulic velocity fuse to limit down speed for each cylinder.
 3. Remote-Control Station: Multibutton control station of the constant-pressure type with UP and DOWN push buttons. Controller shall consist of magnetic motor starter with three-pole adjustable overloads and 24-V control transformer with 4-A, fused secondary prewired to terminal strips and enclosed in NEMA ICS 6, **[Type 12]<Insert type>** box.
 - a. Upper-Travel-Limit Switch: Equip unit with manufacturer's standard, adjustable, upper-

travel-limit switch.

- I. Construction: Fabricate lift from structural-steel shapes rigidly welded and reinforced for maximum strength, safety, and stability. Design assembly to withstand deformation during both operating and stored phases of service. Provide mounting brackets and removable lifting eyes for ease of installation.
 - 1. Scissors Mechanism: Fabricate leg members from heavy, [**hot-dip galvanized**] steel-formed tube or plate members to provide maximum strength and rigidity.
 - 2. Scissors Configuration: [**Single leg**][**Multiple width**][**Multiple length**].
 - 3. Bearings: Pivot points with permanently lubricated antifriction bushings or sealed ball-bearings for minimum maintenance.
 - 4. Maintenance Leg: Removable, safety maintenance leg or hinged, safety maintenance bars.
- J. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade **55 (380)**.
 - 3. Steel Tubing: ASTM A500/A500M, cold formed.

2.2 FINISH REQUIREMENTS

- A. Baked-on Factory Finish: Provide unless otherwise indicated. Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat in manufacturer's standard color.
 - 1. Toe Guards: Paint to comply with ANSI Z535.1.
- B. Hot-Dip Galvanizing: Comply with the following:
 - 1. ASTM A123/A123M for iron and steel portable dock equipment.
 - 2. ASTM A153/A153M or ASTM F2329/F2329M for iron and steel hardware for portable dock equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical systems for portable dock equipment to verify actual locations of connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install portable dock equipment as required for a complete installation.

3.3 ADJUSTING

- A. Adjust portable dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.
- B. Test lifts for vertical travel and adjust to maintain operating range indicated.
- C. After completing installation of exposed, factory-finished portable dock equipment, inspect exposed finishes and repair damaged finishes.

3.4 MAINTENANCE SERVICE

- A. Beginning at Substantial Completion, maintenance service shall include **[three][six][nine][12]** months' full maintenance by **[skilled employees of portable dock equipment installer][manufacturer's authorized service representative]**. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper portable dock equipment operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain portable dock equipment.

END OF SECTION 11 13 23 00



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Task	Specification	Specification Description
11 13 23 23	11 13 23 00	Portable Dock Equipment
11 21 63 00	11 40 00 00	Foodservice Equipment



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SECTION 11 30 13 00 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cooking appliances.
2. Kitchen exhaust ventilation.
3. Refrigeration appliances.
4. Cleaning appliances.
5. Trash compactors.

B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for kitchen sinks, dishwasher air-gap fittings, waste (garbage) disposers, and instant hot-water dispensers.

1.2 ALLOWANCES

- A. Furnish residential appliances as part of residential appliance allowance.
- B. Furnish **<Insert item and drawing designation>** as part of **[residential appliance]<Insert allowance designation>** allowance.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Samples: For each exposed product and for each color and texture specified, in **[manufacturer's standard]<Insert dimensions>** size.
- C. Product Schedule: For appliances. **[Use same designations indicated on Drawings.]**
- D. Sustainable Design Submittals:
1. Product Data: For indicated products, indicating compliance with requirements for ENERGY STAR product labeling.
 2. ENERGY STAR: Product data for indicated products, showing compliance with requirements for

11 - Equipment

- ENERGY STAR product labeling.
3. Product Data: For water-efficient clothes washer, indicating compliance with requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintains, within **<Insert miles (km)>** of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- B. Gas-Fuel Conversion: Provide gas-fueled appliances with manufacturer's **[high-altitude][and][propane]** conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.8 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period[.][**except as qualified below:**]
 1. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.
- B. Electric Cooktop and Range: **[Full warranty, including parts and labor,][Limited warranty, including parts and labor for first year and parts thereafter,]<Insert description>** for on-site service on surface-burner elements.
 1. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.
- C. Microwave Oven: **[Full warranty, including parts and labor,][Limited warranty, including parts and labor for first year and parts thereafter,]** for on-site service **[on the magnetron tube]<Insert requirement>**.
 1. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.
- D. Refrigerator/Freezer, Freezer, and Icemaker, Sealed System: **[Full warranty, including parts and labor,][Limited warranty, including parts and labor for first year and parts thereafter,]** for on-site service on the product.

1. Warranty Period for **[Sealed Refrigeration System]<Insert item>: [Two][Five]<Insert number>** years from date of Substantial Completion.
 2. Warranty Period **[for Other Components]<Insert requirement>: [Two]<Insert number>** years from date of Substantial Completion.
- E. Dishwasher: **[Full warranty, including parts and labor,][Limited warranty, including parts and labor for first year and parts thereafter,]** for on-site service on the product.
1. Warranty Period for **[Deterioration of Tub and Metal Door Liner]<Insert requirement>: [Three][Five][10]<Insert number>** years from date of Substantial Completion.
 2. Warranty Period **[for Other Components]<Insert requirement>: [Two]<Insert number>** years from date of Substantial Completion.
- F. Clothes Washer: **[Full warranty, including parts and labor,][Limited warranty, including parts and labor for first year and parts thereafter,]<Insert description>** for on-site service on the product.
1. Warranty Period: **[Two][Three]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain **[residential appliances from single source][and][each type of residential appliance from single manufacturer]**.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in **[the DOJ's 2010 ADA Standards for Accessible Design][the ABA standards of the Federal agency having jurisdiction][and][ICC A117.1]<Insert requirement>**.

2.3 COOKING APPLIANCES

- A. Electric Cooktop :
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Bosch US; BSH Home Appliances Corporation]**
 - b. **[Dacor, Inc.]**
 - c. **[Fisher & Paykel Appliances Ltd]**
 - d. **[Frigidaire]**
 - e. **[Gaggenau; BSH Home Appliances Corporation]**

- f. [GE Appliances; Haier Group]
 - g. [Jennair; Whirlpool Corporation]
 - h. [Kenmore; Transformco SR Brands LLC]
 - i. [KitchenAid; Whirlpool Corporation]
 - j. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - k. [Maytag; Whirlpool Corporation]
 - l. [Miele]
 - m. [Thermador; BSH Home Appliances Corporation]
 - n. [Viking Range, LLC; Middleby Corporation]
 - o. [Whirlpool Corporation]
 - p. [Wolf; Sub-Zero Group, Inc.]
 - q. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Bosch US; BSH Home Appliances Corporation]
 - b. [Dacor, Inc.]
 - c. [Fisher & Paykel Appliances Ltd]
 - d. [Frigidaire]
 - e. [Gaggenau; BSH Home Appliances Corporation]
 - f. [GE Appliances; Haier Group]
 - g. [Jennair; Whirlpool Corporation]
 - h. [Kenmore; Transformco SR Brands LLC]
 - i. [KitchenAid; Whirlpool Corporation]
 - j. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - k. [Maytag; Whirlpool Corporation]
 - l. [Miele]
 - m. [Thermador; BSH Home Appliances Corporation]
 - n. [Viking Range, LLC; Middleby Corporation]
 - o. [Whirlpool Corporation]
 - p. [Wolf; Sub-Zero Group, Inc.]
 - q. <Insert manufacturer's name>
3. Width: [12 inches (305 mm)][30 inches (762 mm)][36 inches (914 mm)]<Insert dimension>.
4. Electric Burner Elements: [Two][Four][Six]<Insert number>.
- a. Coil Type: [Manufacturer's standard][Two 1200 W and two 2200 W][One 1200 W, one 2200-W dual element, and two 2200 W]<Insert burner combination and power ratings>.
 - b. Radiant Type: [Two 1500 W and two 2000 W][One 1200-W element, dual 1500-W/1500-W bridge element, and one 1200-W/2500-W expandable element]<Insert burner combination and power ratings>.
 - c. Induction Type: [Manufacturer's standard][Two 1200 W and two 1800 W][One 1200 W, one 1800 W, one 2700 W, and one 3300 W]<Insert burner combination and power ratings>.
5. Controls: Digital panel controls, located [on front][on left side][on right side][remotely, where indicated].
6. Downdraft Ventilation: [Manufacturer's standard][550 cfm (260 L/s)]<Insert capacity> built-in downdraft ventilation, with [remote]blower and exterior weatherproof wall cap.
7. Other Features: [Grill][deep fryer][wok burner][and][wok ring]<Insert feature>.
8. Electric Power Supply: [240 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>.

9. Top Material: **[Manufacturer's standard][Ceramic glass][Porcelain-enameled steel][Stainless steel]<Insert material>**.

a. Color/Finish: **[White][Black]<Insert color or finish>**.

B. Gas Cooktop :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[Bosch US; BSH Home Appliances Corporation]**
 - b. **[Dacor, Inc.]**
 - c. **[DCS Appliances; Fisher and Paykel Appliances Ltd]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[Gaggenau; BSH Home Appliances Corporation]**
 - g. **[GE Appliances; Haier Group]**
 - h. **[Jennair; Whirlpool Corporation]**
 - i. **[Kenmore; Transformco SR Brands LLC]**
 - j. **[KitchenAid; Whirlpool Corporation]**
 - k. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - l. **[Maytag; Whirlpool Corporation]**
 - m. **[Miele]**
 - n. **[Thermador; BSH Home Appliances Corporation]**
 - o. **[Viking Range, LLC; Middleby Corporation]**
 - p. **[Whirlpool Corporation]**
 - q. **[Wolf; Sub-Zero Group, Inc.]**
 - r. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Bosch US; BSH Home Appliances Corporation]**
 - b. **[Dacor, Inc.]**
 - c. **[DCS Appliances; Fisher and Paykel Appliances Ltd]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[Gaggenau; BSH Home Appliances Corporation]**
 - g. **[GE Appliances; Haier Group]**
 - h. **[Jennair; Whirlpool Corporation]**
 - i. **[Kenmore; Transformco SR Brands LLC]**
 - j. **[KitchenAid; Whirlpool Corporation]**
 - k. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - l. **[Maytag; Whirlpool Corporation]**
 - m. **[Miele]**
 - n. **[Thermador; BSH Home Appliances Corporation]**
 - o. **[Viking Range, LLC; Middleby Corporation]**
 - p. **[Whirlpool Corporation]**
 - q. **[Wolf; Sub-Zero Group, Inc.]**
 - r. **<Insert manufacturer's name>**
3. Width: **[12 inches (305 mm)][30 inches (762 mm)][36 inches (914 mm)]<Insert dimension>**.
4. Gas Burners: **[Two][Four][Six]<Insert number>**.

- a. Power Ratings: **[Manufacturer's standard][One 5000 Btu/h (1500 W), two 9100 Btu/h (2700 W), and one 12,000 Btu/h (3500 W)]<Insert burner combination and power ratings>**.
 - b. Grates: **[Individual][Continuous]<Insert description>**.
 5. Controls: **[Digital panel][Manual-dial]** controls, located on **[front][left side][right side]**.
 6. Downdraft Ventilation: **[Manufacturer's standard][550 cfm (260 L/s)]<Insert capacity>** built-in downdraft ventilation, with **[remote]** blower and exterior weatherproof wall cap.
 7. Other Features: **[Sealed burners][auto-reigniting burners][grill][deep fryer][wok burner][and][wok ring]<Insert feature>**.
 8. Electric Power Supply: **[120 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>**.
 9. Top Material: **[Manufacturer's standard][Ceramic glass][Porcelain-enameled steel][Stainless steel]<Insert material>**.
 - a. Color/Finish: **[White][Black]<Insert color or finish>**.
- C. Electric Range : **[Freestanding][Slide-in][Drop-in]** range with **[one][two]** oven(s) and complying with AHAM ER-1.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[Bosch US; BSH Home Appliances Corporation]**
 - c. **[Dacor, Inc.]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[GE Appliances; Haier Group]**
 - g. **[Jennair; Whirlpool Corporation]**
 - h. **[Kenmore; Transformco SR Brands LLC]**
 - i. **[KitchenAid; Whirlpool Corporation]**
 - j. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - k. **[Maytag; Whirlpool Corporation]**
 - l. **[Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]**
 - m. **[Viking Range, LLC; Middleby Corporation]**
 - n. **[Whirlpool Corporation]**
 - o. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[Bosch US; BSH Home Appliances Corporation]**
 - c. **[Dacor, Inc.]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[GE Appliances; Haier Group]**
 - g. **[Jennair; Whirlpool Corporation]**
 - h. **[Kenmore; Transformco SR Brands LLC]**
 - i. **[KitchenAid; Whirlpool Corporation]**
 - j. **[LG Electronics USA, Inc.; LG Electronics Inc.]**

- k. **[Maytag; Whirlpool Corporation]**
 - l. **[Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]**
 - m. **[Viking Range, LLC; Middleby Corporation]**
 - n. **[Whirlpool Corporation]**
 - o. **<Insert manufacturer's name>**
 3. Width: **[30 inches (762 mm)][36 inches (914 mm)]<Insert dimension>**.
 4. Electric Burner Elements: **[Four][Six]<Insert number>**.
 - a. Coil Type: **[Manufacturer's standard][Two 1200 W and two 2200 W][One 1200 W, one 2200-W dual element, and two 2200 W]<Insert burner combination and power ratings>**.
 - b. Radiant Type: **[Two 1500 W and two 2000 W][One 1200-W element, dual 1500-W/1500-W bridge element, and one 1200-W/2500-W expandable element]<Insert burner combination and power ratings>**.
 - c. Induction Type: **[Manufacturer's standard][Two 1200 W and two 1800 W][One 1200 W, one 1800 W, one 2700 W, and one 3300 W]<Insert burner combination and power ratings>**.
 - d. Controls: Digital panel controls, located on **[front][left side][right side][splash panel at rear of rangetop]**.
 - e. **<Insert feature>**.
 5. Oven Features:
 - a. Capacity: **[3.3 cu. ft. (0.09 cu. m)][and]<Insert capacity for each oven>**.
 - b. Operation: **[Baking][convection][and][pyrolytic self-cleaning or catalytic continuous cleaning]<Insert requirement>**.
 - c. Broiler: Located in **[top of oven][separate roll-out drawer on bottom]**.
 - d. Oven Door(s): Counterbalanced, removable, with **[observation window][and][full-width]<Insert type of handle>** handle.
 - e. Electric Power Rating:
 - 1) Oven(s): **[Manufacturer's standard][2400 W][and]<Insert power rating for each oven>**.
 - 2) Broiler: **[Manufacturer's standard][3500 W]<Insert power rating>**.
 - f. Controls: Digital panel controls and timer display, located on **[front][left side][right side][splash panel at rear of rangetop]**.
 - g. **<Insert feature>**.
 6. Anti-Tip Device: Manufacturer's standard.
 7. Electric Power Supply: **[240 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>**.
 8. Material: **[Porcelain-enameled][Stainless] steel with [manufacturer's standard][ceramic-glass]<Insert material>** cooktop.
 - a. Color/Finish: **[White][Black]<Insert color or finish>**.
- D. Gas Range : **[Freestanding][Slide-in] range with [one][two] oven(s)**.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amana; Whirlpool Corporation]**

- b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [Kenmore; Transformco SR Brands LLC]
 - j. [KitchenAid; Whirlpool Corporation]
 - k. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - l. [Maytag; Whirlpool Corporation]
 - m. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - n. [Thermador; BSH Home Appliances Corporation]
 - o. [Viking Range, LLC; Middleby Corporation]
 - p. [Whirlpool Corporation]
 - q. [Wolf; Sub-Zero Group, Inc.]
 - r. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [Kenmore; Transformco SR Brands LLC]
 - j. [KitchenAid; Whirlpool Corporation]
 - k. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - l. [Maytag; Whirlpool Corporation]
 - m. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - n. [Thermador; BSH Home Appliances Corporation]
 - o. [Viking Range, LLC; Middleby Corporation]
 - p. [Whirlpool Corporation]
 - q. [Wolf; Sub-Zero Group, Inc.]
 - r. <Insert manufacturer's name>
3. Width: [30 inches (762 mm)][36 inches (914 mm)]<Insert dimension>.
4. Gas Burners: [Four][Six]<Insert number>.
 - a. Power Ratings: [Manufacturer's standard][One 5000 Btu/h (1500 W), two 9100 Btu/h (2700 W), and one 12,000 Btu/h (3500 W)]<Insert burner combination and power ratings>.
 - b. Controls: [Digital panel][Manual-dial] controls, located on [front][left side][right side][splash panel at rear of rangetop].
 - c. Grates: [Individual][Continuous]<Insert description>.
 - d. Other Feature(s): [Sealed burners][auto-reigniting burners][and][grill]<Insert feature>.
5. Oven Features:
 - a. Capacity: [3.3 cu. ft. (0.09 cu. m)][and]<Insert capacity for each oven>.

- b. Operation: **[Baking][convection][and][pyrolytic self-cleaning or catalytic continuous cleaning]<Insert requirement>**.
 - c. Broiler: Located in **[top of oven][separate roll-out drawer on bottom]**.
 - d. Oven Door(s): Counterbalanced, removable, with **[observation window][and][full-width]<Insert type of handle>** handle.
 - e. Gas Power Ratings:
 - 1) Oven(s): **[Manufacturer's standard][9100 Btu/h (2700 W)][and]<Insert power rating for each oven>**.
 - 2) Broiler: **[Manufacturer's standard][14,500 Btu/h (4200 W)]<Insert power rating>**.
 - f. Controls: **[Digital panel][Manual-dial]** controls and timer display, located on **[front][left side][right side][splash panel at rear of rangetop]**.
 - g. **<Insert feature>**.
6. Anti-Tip Device: Manufacturer's standard.
 7. Electric Power Supply: **[120 V, 60 Hz, 1 phase, 15 A][As indicated on Drawings]<Insert requirement>**.
 8. Material: **[Porcelain-enameled][Stainless]** steel with **[manufacturer's standard][ceramic-glass]<Insert material>** cooktop.
 - a. Color/Finish: **[White][Black]<Insert color or finish>**.
- E. Dual Fuel Range : **[Freestanding][Slide-in]** range with gas burners and **[one][two]** electric oven(s).
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[Bosch US; BSH Home Appliances Corporation]**
 - c. **[Dacor, Inc.]**
 - d. **[DCS Appliances; Fisher and Paykel Appliances Ltd]**
 - e. **[Fisher & Paykel Appliances Ltd]**
 - f. **[Frigidaire]**
 - g. **[GE Appliances; Haier Group]**
 - h. **[Jennair; Whirlpool Corporation]**
 - i. **[Kenmore; Transformco SR Brands LLC]**
 - j. **[KitchenAid; Whirlpool Corporation]**
 - k. **[Thermador; BSH Home Appliances Corporation]**
 - l. **[Viking Range, LLC; Middleby Corporation]**
 - m. **[Wolf; Sub-Zero Group, Inc.]**
 - n. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[Bosch US; BSH Home Appliances Corporation]**
 - c. **[Dacor, Inc.]**
 - d. **[DCS Appliances; Fisher and Paykel Appliances Ltd]**
 - e. **[Fisher & Paykel Appliances Ltd]**
 - f. **[Frigidaire]**
 - g. **[GE Appliances; Haier Group]**

- h. [Jennair; Whirlpool Corporation]
 - i. [Kenmore; Transformco SR Brands LLC]
 - j. [KitchenAid; Whirlpool Corporation]
 - k. [Thermador; BSH Home Appliances Corporation]
 - l. [Viking Range, LLC; Middleby Corporation]
 - m. [Wolf; Sub-Zero Group, Inc.]
 - n. <Insert manufacturer's name>
3. Width: [30 inches (762 mm)][36 inches (914 mm)]<Insert dimension>.
4. Gas Burners: [Four][Six]<Insert number>.
- a. Power Ratings: [Manufacturer's standard][One 5000 Btu/h (1500 W), two 9100 Btu/h (2700 W), and one 12,000 Btu/h (3500 W)]<Insert burner combination and power ratings>.
 - b. Controls: [Digital panel][Manual-dial] controls, located on [front][left side][right side][splash panel at rear of rangetop].
 - c. Grates: [Individual][Continuous]<Insert description>.
 - d. <Insert feature>.
5. Oven Features:
- a. Capacity: [3.3 cu. ft. (0.09 cu. m)][and]<Insert capacity for each oven>.
 - b. Operation: [Baking][convection][and][pyrolytic self-cleaning or catalytic continuous cleaning]<Insert requirement>.
 - c. Broiler: Located in [top of oven][separate roll-out drawer on bottom].
 - d. Oven Door(s): Counterbalanced, removable, with [observation window][and][full-width]<Insert type of handle> handle.
 - e. Electric Power Rating:
 - 1) Oven(s): [Manufacturer's standard][2400 W][and]<Insert power rating for each oven>.
 - 2) Broiler: [Manufacturer's standard][3500 W]<Insert power rating>.
 - f. Controls: [Digital panel][Manual-dial] controls and timer display, located on [front][left side][right side][splash panel at rear of rangetop].
 - g. <Insert feature>.
6. Anti-Tip Device: Manufacturer's standard.
7. Electric Power Supply: [240 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>.
8. Material: [Porcelain-enameled][Stainless] steel with [manufacturer's standard][ceramic-glass]<Insert material> cooktop.
- a. Color/Finish: [White][Black]<Insert color or finish>.

F. Electric Wall Oven : [One][Two]-oven unit.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Bosch US; BSH Home Appliances Corporation]
 - b. [Dacor, Inc.]
 - c. [DCS Appliances; Fisher and Paykel Appliances Ltd]

- d. [Fisher & Paykel Appliances Ltd]
 - e. [Frigidaire]
 - f. [Gaggenau; BSH Home Appliances Corporation]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [Kenmore; Transformco SR Brands LLC]
 - j. [KitchenAid; Whirlpool Corporation]
 - k. [Maytag; Whirlpool Corporation]
 - l. [Miele]
 - m. [Thermador; BSH Home Appliances Corporation]
 - n. [Viking Range, LLC; Middleby Corporation]
 - o. [Whirlpool Corporation]
 - p. [Wolf; Sub-Zero Group, Inc.]
 - q. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Bosch US; BSH Home Appliances Corporation]
 - b. [Dacor, Inc.]
 - c. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - d. [Fisher & Paykel Appliances Ltd]
 - e. [Frigidaire]
 - f. [Gaggenau; BSH Home Appliances Corporation]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [Kenmore; Transformco SR Brands LLC]
 - j. [KitchenAid; Whirlpool Corporation]
 - k. [Maytag; Whirlpool Corporation]
 - l. [Miele]
 - m. [Thermador; BSH Home Appliances Corporation]
 - n. [Viking Range, LLC; Middleby Corporation]
 - o. [Whirlpool Corporation]
 - p. [Wolf; Sub-Zero Group, Inc.]
 - q. <Insert manufacturer's name>
3. Mounting: Built-in [wall][undercounter]<Insert requirement>.
4. Capacity: [3.3 cu. ft. (0.09 cu. m)][and]<Insert capacity for each oven>.
5. Operation: [Baking][convection][and][pyrolytic self-cleaning or catalytic continuous cleaning]<Insert requirement>.
6. Broiler: Located in [top of oven][separate roll-out drawer on bottom]<Insert requirement>.
7. Oven Door(s): Counterbalanced, removable, with [observation window][and][full-width]<Insert type of handle> handle.
8. Electric Power Rating:
 - a. Oven(s): [Manufacturer's standard][2400 W][and]<Insert power rating for each oven>.
 - b. Broiler: [Manufacturer's standard][3500 W]<Insert power rating>.
9. Electric Power Supply: [240 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>.
10. Controls: [Digital panel][Manual-dial] controls and timer display.
11. <Insert feature>.
12. Material: [Porcelain-enameled steel][Stainless steel][Manufacturer's standard]<Insert material>.

a. Color/Finish: **[White][Black]<Insert color or finish>**.

G. Gas Wall Oven : **[One][Two]-oven unit**.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Frigidaire]**
 - b. **[GE Appliances; Haier Group]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Frigidaire]**
 - b. **[GE Appliances; Haier Group]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **<Insert manufacturer's name>**
3. Mounting: Built-in **[wall][undercounter]<Insert requirement>**.
4. Capacity: **[3.3 cu. ft. (0.09 cu. m)][and]<Insert capacity for each oven>**.
5. Operation: **[Baking][convection][and][pyrolytic self-cleaning or catalytic continuous cleaning]<Insert requirement>**.
6. Broiler: Located in **[top of oven][separate roll-out drawer on bottom]<Insert requirement>**.
7. Oven Door(s): Counterbalanced, removable, with **[observation window][and][full-width]<Insert type of handle>** handle.
8. Gas Power Ratings:
 - a. Oven(s): **[Manufacturer's standard][9100 Btu/h (2700 W)][and]<Insert power rating for each oven>**.
 - b. Broiler: **[Manufacturer's standard][14,500 Btu/h (4200 W)]<Insert power rating>**.
9. Electric Power Supply: **[120 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>**.
10. Controls: **[Digital panel][Manual-dial]** controls and timer display
11. **<Insert feature>**.
12. Material: **[Porcelain-enameled steel][Stainless steel][Manufacturer's standard]<Insert material>**.
 - a. Color/Finish: **[White][Black]<Insert color or finish>**.

H. Microwave Oven :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amana; Whirlpool Corporation]**

- b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [Gaggenau; BSH Home Appliances Corporation]
 - h. [GE Appliances; Haier Group]
 - i. [Jennair; Whirlpool Corporation]
 - j. [Kenmore; Transformco SR Brands LLC]
 - k. [KitchenAid; Whirlpool Corporation]
 - l. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - m. [Maytag; Whirlpool Corporation]
 - n. [Miele]
 - o. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - p. [Sharp Electronics Corp.]
 - q. [Thermador; BSH Home Appliances Corporation]
 - r. [Viking Range, LLC; Middleby Corporation]
 - s. [Whirlpool Corporation]
 - t. [Wolf; Sub-Zero Group, Inc.]
 - u. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [Gaggenau; BSH Home Appliances Corporation]
 - h. [GE Appliances; Haier Group]
 - i. [Jennair; Whirlpool Corporation]
 - j. [Kenmore; Transformco SR Brands LLC]
 - k. [KitchenAid; Whirlpool Corporation]
 - l. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - m. [Maytag; Whirlpool Corporation]
 - n. [Miele]
 - o. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - p. [Sharp Electronics Corp.]
 - q. [Thermador; BSH Home Appliances Corporation]
 - r. [Viking Range, LLC; Middleby Corporation]
 - s. [Whirlpool Corporation]
 - t. [Wolf; Sub-Zero Group, Inc.]
 - u. <Insert manufacturer's name>
3. Mounting: [Undercabinet][Wall cabinet]<Insert requirement>.
4. Type: [Conventional][Convection]<Insert type>.
5. Dimensions:
 - a. Width: [24 inches (610 mm)][30 inches (762 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [19-1/2 inches (495 mm)][As indicated on Drawings]<Insert dimension>.
 - c. Height: [14 inches (356 mm)][18 inches (457 mm)][As indicated on Drawings]<Insert dimension>.

6. Capacity: [1.5 cu. ft. (0.04 cu. m)][2.0 cu. ft. (0.06 cu. m)]<Insert capacity>.
7. Oven Door: Door with observation window [and pull handle][and pushbutton latch release]<Insert requirement>.
8. Exhaust Fan: [Variable][Two][Four]-speed fan, [vented to outside][nonvented, recirculating type with charcoal filter] and with [manufacturer's standard][300 cfm (140 L/s)]<Insert value> capacity.
9. Microwave Power Rating: [Manufacturer's standard][1000 W]<Insert power rating>.
 - a. Convection Element Power Rating: [Manufacturer's standard][1450 W]<Insert power rating>.
10. Electric Power Supply: [120 V, 60 Hz, 1 phase, 15 A][As indicated on Drawings]<Insert requirement>.
11. Controls: Digital panel controls and timer display.
12. Other Features: [Turntable][temperature probe][and][lock-out feature]<Insert feature>.
13. Material: [Porcelain-enameled steel][Stainless steel][Manufacturer's standard]<Insert material>.
 - a. Color/Finish: [White][Black]<Insert color or finish>.

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [Gaggenau; BSH Home Appliances Corporation]
 - h. [GE Appliances; Haier Group]
 - i. [Jennair; Whirlpool Corporation]
 - j. [Kenmore; Transformco SR Brands LLC]
 - k. [KitchenAid; Whirlpool Corporation]
 - l. [Maytag; Whirlpool Corporation]
 - m. [Miele]
 - n. [Thermador; BSH Home Appliances Corporation]
 - o. [Viking Range, LLC; Middleby Corporation]
 - p. [Whirlpool Corporation]
 - q. [Wolf; Sub-Zero Group, Inc.]
 - r. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]

- c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Fisher & Paykel Appliances Ltd]
 - f. [Frigidaire]
 - g. [Gaggenau; BSH Home Appliances Corporation]
 - h. [GE Appliances; Haier Group]
 - i. [Jennair; Whirlpool Corporation]
 - j. [Kenmore; Transformco SR Brands LLC]
 - k. [KitchenAid; Whirlpool Corporation]
 - l. [Maytag; Whirlpool Corporation]
 - m. [Miele]
 - n. [Thermador; BSH Home Appliances Corporation]
 - o. [Viking Range, LLC; Middleby Corporation]
 - p. [Whirlpool Corporation]
 - q. [Wolf; Sub-Zero Group, Inc.]
 - r. <Insert manufacturer's name>
3. Type: [Wall-mounted,][Suspended-island-canopy,]<Insert requirement> exhaust-hood system.
4. Dimensions:
- a. Width: [30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)][As indicated on Drawings]<Insert dimension>.
5. Exhaust Fan: [Variable][Two][Three]-speed fan [built into hood][remotely located, with separate housing] and with [manufacturer's standard][500 cfm (236 L/s)][900 cfm (425 L/s)]<Insert value> capacity.
- a. Venting: [Vented to outside through roof with weatherproof roof cap, backdraft damper, and rodent-proof screening][Vented to outside through wall with weatherproof wall cap, backdraft damper, and rodent-proof screening][Nonvented, recirculating type with charcoal filter][As indicated on Drawings]<Insert requirement>.
 - b. Fan Control: [Hood][Wall]-mounted[touch-pad to control] fan switch, with separate hood-light control switch.
6. Duct Type: [Manufacturer's standard][7-inch- (175-mm-) diameter round][3-1/4 by 10 inches (82 by 250 mm) rectangular][As indicated on Drawings]<Insert requirement>.
7. Finish: [Baked enamel][Stainless steel]<Insert finish>.
- a. Color: [White]<Insert color>.
8. Features:
- a. Permanent, washable [aluminum-mesh][stainless steel-mesh][baffle-type] filter(s).
 - b. Built-in [halogen][incandescent][fluorescent] lighting.
 - c. Warming lamp socket(s).
 - d. <Insert feature>.

B. Downdraft Exhaust :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Frigidaire]
 - f. [Gaggenau; BSH Home Appliances Corporation]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [KitchenAid; Whirlpool Corporation]
 - j. [Maytag; Whirlpool Corporation]
 - k. [Miele]
 - l. [Thermador; BSH Home Appliances Corporation]
 - m. [Viking Range, LLC; Middleby Corporation]
 - n. [Whirlpool Corporation]
 - o. [Wolf; Sub-Zero Group, Inc.]
 - p. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Amana; Whirlpool Corporation]
 - b. [Bosch US; BSH Home Appliances Corporation]
 - c. [Dacor, Inc.]
 - d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - e. [Frigidaire]
 - f. [Gaggenau; BSH Home Appliances Corporation]
 - g. [GE Appliances; Haier Group]
 - h. [Jennair; Whirlpool Corporation]
 - i. [KitchenAid; Whirlpool Corporation]
 - j. [Maytag; Whirlpool Corporation]
 - k. [Miele]
 - l. [Thermador; BSH Home Appliances Corporation]
 - m. [Viking Range, LLC; Middleby Corporation]
 - n. [Whirlpool Corporation]
 - o. [Wolf; Sub-Zero Group, Inc.]
 - p. <Insert manufacturer's name>
3. Type: [Retractable-downdraft]<Insert requirement> exhaust system.
4. Width: [30 inches (762 mm)][36 inches (914 mm)][As indicated on Drawings]<Insert dimension>.
5. Exhaust Fan: [Variable][Two][Three]-speed fan [built into cabinet below countertop][remotely located, with separate housing] and with [manufacturer's standard][500 cfm (236 L/s)][900 cfm (425 L/s)]<Insert value> capacity.
- a. Venting: [Vented to outside through roof with weatherproof roof cap, backdraft damper, and rodent-proof screening][Vented to outside through wall with weatherproof wall cap, backdraft damper, and rodent-proof screening][Nonvented, recirculating type with charcoal filter][As indicated on Drawings]<Insert requirement>.
 - b. Fan Control: [Countertop]<Insert location>-mounted [touch-pad to control] fan switch.
6. Duct Type: [Manufacturer's standard][7-inch- (175-mm-) diameter round][3-1/4 by 10 inches

- (82 by 250 mm) rectangular<Insert requirement>.
7. Finish: [Baked enamel][Stainless steel]<Insert finish>.
- a. Color: [White]<Insert color>.
8. Features:
- a. Permanent, washable [aluminum-mesh][stainless steel-mesh][baffle-type] filter(s).
- b. <Insert feature>.

2.5 REFRIGERATION APPLIANCES

- A. Refrigerator/Freezer : [One-door refrigerator with freezer compartment inside][Two-door, side-by-side refrigerator/freezer][Two-door refrigerator/freezer with freezer on top][Two-door refrigerator/freezer with freezer on bottom]<Insert description> and complying with AHAM HRF-1.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Amana; Whirlpool Corporation]
- b. [Bosch US; BSH Home Appliances Corporation]
- c. [Dacor, Inc.]
- d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
- e. [Fisher & Paykel Appliances Ltd]
- f. [Frigidaire]
- g. [Gaggenau; BSH Home Appliances Corporation]
- h. [GE Appliances; Haier Group]
- i. [Jennair; Whirlpool Corporation]
- j. [Kenmore; Transformco SR Brands LLC]
- k. [KitchenAid; Whirlpool Corporation]
- l. [LG Electronics USA, Inc.; LG Electronics Inc.]
- m. [Maytag; Whirlpool Corporation]
- n. [Miele]
- o. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
- p. [Thermador; BSH Home Appliances Corporation]
- q. [Viking Range, LLC; Middleby Corporation]
- r. [Whirlpool Corporation]
- s. [Wolf; Sub-Zero Group, Inc.]
- t. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Amana; Whirlpool Corporation]
- b. [Bosch US; BSH Home Appliances Corporation]
- c. [Dacor, Inc.]
- d. [DCS Appliances; Fisher and Paykel Appliances Ltd]
- e. [Fisher & Paykel Appliances Ltd]
- f. [Frigidaire]
- g. [Gaggenau; BSH Home Appliances Corporation]
- h. [GE Appliances; Haier Group]
- i. [Jennair; Whirlpool Corporation]

- j. [Kenmore; Transformco SR Brands LLC]
 - k. [KitchenAid; Whirlpool Corporation]
 - l. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - m. [Maytag; Whirlpool Corporation]
 - n. [Miele]
 - o. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - p. [Thermador; BSH Home Appliances Corporation]
 - q. [Viking Range, LLC; Middleby Corporation]
 - r. [Whirlpool Corporation]
 - s. [Wolf; Sub-Zero Group, Inc.]
 - t. <Insert manufacturer's name>
3. Type: [Freestanding][Built in][Undercounter].
4. Dimensions:
- a. Width: [16 inches (406 mm)][24 inches (610 mm)][27 inches (686 mm)][30 inches (762 mm)][36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [24 inches (610 mm)][27 inches (686 mm)][33-1/4 inches (845 mm)][As indicated on Drawings]<Insert dimension>.
 - c. Height: [34-1/2 inches (876 mm)][70 inches (1778 mm)][73 inches (1854 mm)][84 inches (2134 mm)][As indicated on Drawings]<Insert dimension>.
5. Storage Capacity:
- a. Refrigeration Compartment Volume: [15.6 cu. ft. (0.44 cu. m)]<Insert volume>.
 - b. Freezer Volume: [5.13 cu. ft. (0.15 cu. m)]<Insert volume>.
 - c. Shelf Area: [Three]<Insert number> adjustable [wire][glass] shelves, [26 sq. ft. (2.42 sq. m)]<Insert area>.
 - d. <Insert storage requirement>.
6. General Features:
- a. Door Configuration: [Framed][Overlay].
 - b. Dispenser in door for [ice][and][cold water][with dispenser lock].
 - c. Built-in water-filtration system.
 - d. Dual refrigeration systems.
 - e. Separate[touch-pad] temperature controls for each compartment.
 - f. <Insert feature>.
7. Refrigerator Features:
- a. Interior light in refrigeration compartment.
 - b. Compartment Storage: [Wine racks][vegetable crisper][and][meat compartment]<Insert requirement>.
 - c. Door Storage: [Glazed door without storage][Modular compartments][1 gal. (3.8 L) milk-container storage]<Insert requirement>.
 - d. Temperature-controlled meat/deli bin.
 - e. <Insert feature>.
8. Freezer Features: [One][Two]<Insert number> freezer compartment(s) [with door(s)][configured as pull-out drawer(s)].
- a. [Automatic][Manual] defrost.
 - b. Interior light in freezer compartment.

- c. Automatic icemaker and storage bin.
 - d. <Insert feature>.
9. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
10. Front Panel(s): **[Manufacturer's standard][Wood panel(s) to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert(s) specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert(s) specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert(s) specified in Section 123530 "Residential Casework" to match kitchen cabinets][Reversible panel(s) with choice of colors]<Insert description>.**
 - a. Panel Color: **[White][Black]<Insert color(s)>.**
11. Appliance Color/Finish: **[White][Black][Stainless steel]<Insert color or finish>.**
- B. Freezer : **[One][Two]<Insert number> freezer compartment(s) [with door(s)][configured as pull-out drawer(s)]<Insert description>** and complying with AHAM HRF-1.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Frigidaire]**
 - b. **[GE Appliances; Haier Group]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **[Miele]**
 - f. **[Thermador; BSH Home Appliances Corporation]**
 - g. **[Viking Range, LLC; Middleby Corporation]**
 - h. **[Whirlpool Corporation]**
 - i. **[Wolf; Sub-Zero Group, Inc.]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Frigidaire]**
 - b. **[GE Appliances; Haier Group]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **[Miele]**
 - f. **[Thermador; BSH Home Appliances Corporation]**
 - g. **[Viking Range, LLC; Middleby Corporation]**
 - h. **[Whirlpool Corporation]**
 - i. **[Wolf; Sub-Zero Group, Inc.]**
 - j. **<Insert manufacturer's name>**
 3. Type: **[Freestanding][Built in][Undercounter].**
 4. Dimensions:
 - a. Width: **[27 inches (686 mm)][30 inches (762 mm)][36 inches (914 mm)][As indicated on Drawings]<Insert dimension>.**
 - b. Depth: **[24 inches (610 mm)][27 inches (686 mm)][As indicated on Drawings]<Insert dimension>.**

- dimension>.**
- c. Height: [34-1/2 inches (876 mm)][70 inches (1778 mm)][73 inches (1854 mm)][84 inches (2134 mm)][As indicated on Drawings]<Insert dimension>.
5. Storage Capacity:
 - a. Volume: [5.13 cu. ft. (0.15 cu. m)][15.0 cu. ft. (0.42 cu. m)]<Insert volume>.
 - b. Shelf Area: [Three]<Insert number> adjustable [wire][glass] shelves, [26 sq. ft. (2.42 sq. m)]<Insert area>.
 6. Features:
 - a. Door Configuration: [Framed][Overlay].
 - b. [Automatic][Manual] defrost.
 - c. Interior light in compartment.
 - d. Automatic icemaker and storage bin.
 - e. Temperature [touch-pad] controls for [each] compartment.
 - f. Defrost drain.
 - g. Lock with key.
 - h. <Insert feature>.
 7. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
 8. Front Panel(s): [Manufacturer's standard][Wood panel(s) to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert(s) specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert(s) specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert(s) specified in Section 123530 "Residential Casework" to match kitchen cabinets]<Insert description>.
 - a. Panel Color: [White][Black]<Insert color(s)>.
 9. Appliance Color/Finish: [White][Black][Stainless steel]<Insert color or finish>.
- C. Icemaker :
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [GE Appliances; Haier Group]
 - b. [Jennair; Whirlpool Corporation]
 - c. [KitchenAid; Whirlpool Corporation]
 - d. [Maytag; Whirlpool Corporation]
 - e. [Viking Range, LLC; Middleby Corporation]
 - f. [Whirlpool Corporation]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [GE Appliances; Haier Group]
 - b. [Jennair; Whirlpool Corporation]

- c. [KitchenAid; Whirlpool Corporation]
 - d. [Maytag; Whirlpool Corporation]
 - e. [Viking Range, LLC; Middleby Corporation]
 - f. [Whirlpool Corporation]
 - g. <Insert manufacturer's name>
3. Type: [Undercounter]<Insert requirement>.
 4. Dimensions:
 - a. Width: [14-3/4 inches (375 mm)][15-1/4 inches (387 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [24 inches (610 mm)][25-1/4 inches (641 mm)][As indicated on Drawings]<Insert dimension>.
 - c. Height: [33-5/8 inches (386 mm)][34-1/2 inches (876 mm)][As indicated on Drawings]<Insert dimension>.
 5. Ice Capacity:
 - a. Production: [30 lb (13.6 kg)][50 lb (22.7 kg)]<Insert value> per day.
 - b. Storage: [25 lb (11.3 kg)][35 lb (15.9 kg)]<Insert value>.
 6. Features:
 - a. Door Configuration: [Framed][Overlay].
 - b. [Automatic defrost]<Insert requirement>.
 - c. Automatic shutoff.
 - d. Defrost drain[with pump].
 - e. <Insert feature>.
 7. Front Panel: [Manufacturer's standard][Wood panel to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets]<Insert description>.
 - a. Panel Color: [White][Black]<Insert color(s)>.
 8. Appliance Color/Finish: [White][Black][Stainless steel]<Insert color or finish>.

2.6 CLEANING APPLIANCES

A. Dishwasher : Complying with AHAM DW-1.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amana; Whirlpool Corporation]
 - b. [ASKO Appliances]
 - c. [Bosch US; BSH Home Appliances Corporation]
 - d. [Dacor, Inc.]
 - e. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - f. [Fisher & Paykel Appliances Ltd]

- g. [Frigidaire]
 - h. [Gaggenau; BSH Home Appliances Corporation]
 - i. [GE Appliances; Haier Group]
 - j. [Jennair; Whirlpool Corporation]
 - k. [Kenmore; Transformco SR Brands LLC]
 - l. [KitchenAid; Whirlpool Corporation]
 - m. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - n. [Maytag; Whirlpool Corporation]
 - o. [Miele]
 - p. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - q. [Thermador; BSH Home Appliances Corporation]
 - r. [Viking Range, LLC; Middleby Corporation]
 - s. [Whirlpool Corporation]
 - t. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amana; Whirlpool Corporation]
 - b. [ASKO Appliances]
 - c. [Bosch US; BSH Home Appliances Corporation]
 - d. [Dacor, Inc.]
 - e. [DCS Appliances; Fisher and Paykel Appliances Ltd]
 - f. [Fisher & Paykel Appliances Ltd]
 - g. [Frigidaire]
 - h. [Gaggenau; BSH Home Appliances Corporation]
 - i. [GE Appliances; Haier Group]
 - j. [Jennair; Whirlpool Corporation]
 - k. [Kenmore; Transformco SR Brands LLC]
 - l. [KitchenAid; Whirlpool Corporation]
 - m. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - n. [Maytag; Whirlpool Corporation]
 - o. [Miele]
 - p. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - q. [Thermador; BSH Home Appliances Corporation]
 - r. [Viking Range, LLC; Middleby Corporation]
 - s. [Whirlpool Corporation]
 - t. <Insert manufacturer's name>
3. Type: [Built-in undercounter][Built-in under sink][Portable]<Insert type>.
4. Dimensions:
 - a. Width: [18 inches (457 mm)][24 inches (610 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [23 inches (584 mm)][25-3/4 inches (654 mm)][As indicated on Drawings]<Insert dimension>.
 - c. Height: [34-1/2 inches (876 mm)][As indicated on Drawings]<Insert dimension>.
5. Capacity:
 - a. International Place Settings of China: [Eight][12][14]<Insert number>.
 - b. Water Consumption for Full Load: [3.2 gal. (12 L)]<Insert value> per cycle.
6. Sound Level: Maximum [42][48]<Insert number> dB.

7. Tub and Door Liner: **[Manufacturer's standard][Porcelain-enameled steel][Stainless steel][Porcelain-enameled steel tub and molded-plastic door liner]<Insert requirement>** with sealed detergent and automatic rinsing-aid dispensers.
 8. Rack System: **[Nylon][PVC]-coated sliding dish racks, with [removable cutlery basket][top cutlery tray]<Insert feature>.**
 9. Controls: **[Touch-pad][Rotary-dial]<Insert description>** controls with **[four]<Insert number>** wash cycles and hot-air and heat-off drying cycle options.
 10. Features:
 - a. Waste food disposer.
 - b. Self-cleaning food-filter system.
 - c. Hot-water booster heater for **[140 deg F (60 deg C)][160 deg F (71 deg C)]** wash water with incoming water at **100 deg F (38 deg C)**.
 - d. Lock-out feature.
 - e. Half-load option.
 - f. Delay-wash option.
 - g. Digital display panel.
 - h. Water softener.
 - i. Soil-sensing water use control system.
 - j. **<Insert feature>.**
 11. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
 12. Front Panel: **[Manufacturer's standard][Wood panel to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets][Reversible panel with choice of colors]<Insert description>.**
 - a. Panel Color: **[White][Black]<Insert color(s)>.**
 13. Appliance Color/Finish: **[White][Black][Stainless steel]<Insert color or finish>.**
- B. Clothes Washer : Complying with AHAM HLW-1.**
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[ASKO Appliances]**
 - c. **[Bosch US; BSH Home Appliances Corporation]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[GE Appliances; Haier Group]**
 - g. **[Kenmore; Transformco SR Brands LLC]**
 - h. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - i. **[Maytag; Whirlpool Corporation]**
 - j. **[Miele]**
 - k. **[Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]**
 - l. **[Whirlpool Corporation]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Amana; Whirlpool Corporation]**
 - b. **[ASKO Appliances]**
 - c. **[Bosch US; BSH Home Appliances Corporation]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[GE Appliances; Haier Group]**
 - g. **[Kenmore; Transformco SR Brands LLC]**
 - h. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - i. **[Maytag; Whirlpool Corporation]**
 - j. **[Miele]**
 - k. **[Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]**
 - l. **[Whirlpool Corporation]**
 - m. **<Insert manufacturer's name>**
3. Type: **[Freestanding][Stacking][Undercounter]**, **[top][front]**-loading unit.
 4. Dimensions:
 - a. Width: **[23-1/2 inches (597 mm)][27 inches (686 mm)][30 inches (762 mm)][As indicated on Drawings]<Insert dimension>**.
 - b. Depth: **[24 inches (610 mm)][29 inches (737 mm)][31 inches (787 mm)][As indicated on Drawings]<Insert dimension>**.
 - c. Height: **[34-1/2 inches (876 mm)][38 inches (965 mm)][45 inches (1143 mm)][As indicated on Drawings]<Insert dimension>**.
 5. Drum: **[Manufacturer's standard][Perforated porcelain-enameled steel][Perforated stainless steel]<Insert material>**.
 - a. Capacity: **[2.7 cu. ft. (0.08 cu. m)][3.2 cu. ft. (0.09 cu. m)][3.8 cu. ft. (0.11 cu. m)]<Insert volume>**.
 6. Controls: **[Touch-pad][Rotary-dial]** controls for water-fill levels, wash/rinse water temperatures, **<Insert function>**, and variable-speed and fabric selectors.
 - a. Wash Cycles: **[Four][Six][10]<Insert number>** wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: **[Three]<Insert number>** settings.
 - c. Speed Combinations: **[Two][Four][Five]**.
 7. Electrical Power: **[120 V, 60 Hz, 1 phase, 15 A][As indicated on Drawings]<Insert requirement>**.
 8. Motor: Manufacturer's standard with built-in overload protector.
 9. Features:
 - a. Agitator: **[Center spindle][Impeller (without spindle)]**.
 - b. Self-cleaning lint filter.
 - c. Unbalanced-load compensator.
 - d. Inlet Hoses: Minimum length **60 inches (1525 mm)**.
 - e. Drain Hoses: Minimum length **48 inches (1220 mm)**.
 - f. Self-leveling legs.
 - g. Automatic dispenser for **[bleach][fabric softener][and][detergent]**.
 - h. Spin-cycle safety switch.
 - i. End-of-cycle signal.

- j. Extra-rinse option.
 - k. Delay-wash option.
 - l. Electronic temperature control.
 - m. Water levels automatically set.
 - n. Pedestal: **[8-inch- (203-mm-) high][15-inch- (381-mm-) high][Manufacturer's standard height]<Insert dimension>** laundry pedestal with storage drawer, matching appliance finish.
 - o. **<Insert feature>**.
 10. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
 11. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
 12. Appliance Finish: **[Enamel][Stainless steel]<Insert finish>**.
 - a. Color: **[White][Almond]<Insert color>**.
 13. Front-Panel Finish: **[Manufacturer's standard][Wood panel to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets]<Insert description>**.
 - a. Panel Color: **[White][Black]<Insert color(s)>**.
- C. Clothes Dryer : Complying with AHAM HLD-1.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[ASKO Appliances]**
 - c. **[Bosch US; BSH Home Appliances Corporation]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**
 - f. **[GE Appliances; Haier Group]**
 - g. **[Kenmore; Transformco SR Brands LLC]**
 - h. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - i. **[Maytag; Whirlpool Corporation]**
 - j. **[Miele]**
 - k. **[Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]**
 - l. **[Whirlpool Corporation]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amana; Whirlpool Corporation]**
 - b. **[ASKO Appliances]**
 - c. **[Bosch US; BSH Home Appliances Corporation]**
 - d. **[Fisher & Paykel Appliances Ltd]**
 - e. **[Frigidaire]**

- f. [GE Appliances; Haier Group]
 - g. [Kenmore; Transformco SR Brands LLC]
 - h. [LG Electronics USA, Inc.; LG Electronics Inc.]
 - i. [Maytag; Whirlpool Corporation]
 - j. [Miele]
 - k. [Samsung Electronics America, Inc. (SEA); Samsung Electronics Co., Ltd. (SEC)]
 - l. [Whirlpool Corporation]
 - m. <Insert manufacturer's name>
3. Type: [Freestanding][Stacking][Undercounter], frontloading, [gas][electric][electric, ventless] unit.
 4. Dimensions:
 - a. Width: [23-1/2 inches (597 mm)][27 inches (686 mm)][As indicated on Drawings]<Insert dimension>.
 - b. Depth: [24 inches (610 mm)][31 inches (787 mm)][As indicated on Drawings]<Insert dimension>.
 - c. Height: [34-1/2 inches (876 mm)][36 inches (914 mm)][As indicated on Drawings]<Insert dimension>.
 5. Drum: [Manufacturer's standard][Perforated porcelain-enameled steel][Perforated stainless steel]<Insert material>.
 - a. Capacity: [5.7 cu. ft. (0.16 cu. m)][7.0 cu. ft. (0.20 cu. m)]<Insert volume>.
 6. Controls: [Touch-pad][Rotary-dial] controls for drying cycle, temperatures, <Insert function,> and fabric selectors.
 7. Electric-Dryer Power: [240 V, 60 Hz, 1 phase, 30 A][As indicated on Drawings]<Insert requirement>.
 8. Gas-Dryer Power: [120 V, 60 Hz, 1 phase, 15 A electric; 22,000-Btu/h (6400-W) gas][As indicated on Drawings]<Insert requirement>.
 9. Features:
 - a. Removable lint filter.
 - b. Electronic temperature and moisture-level-sensor controls.
 - c. End-of-cycle signal.
 - d. Interior drum light.
 - e. Self-leveling legs.
 - f. Antibacterial cycle.
 - g. Auxiliary drying rack.
 - h. Built-in electrical power fuse.
 - i. Stacking kit to stack dryer over washer.
 - j. Pedestal: [8-inch- (203-mm-) high][15-inch- (381-mm-) high][Manufacturer's standard height]<Insert dimension> laundry pedestal with storage drawer, matching appliance finish.
 - k. <Insert feature>.
 10. Appliance Finish: [Enamel][Stainless steel]<Insert finish>.
 - a. Color: [White][Almond]<Insert color>.
 11. Front-Panel Finish: [Manufacturer's standard][Wood panel to match kitchen cabinets][Porcelain enamel][Stainless steel][Wood-panel insert specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen

cabinets][Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets]<Insert description>.

a. Panel Color: **[White][Black]<Insert color(s)>.**

D. Clothes Washer/Dryer Combination : Complying with AHAM HLW-1.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Frigidaire]**
 - b. **[Kenmore; Transformco SR Brands LLC]**
 - c. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **[Whirlpool Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Frigidaire]**
 - b. **[Kenmore; Transformco SR Brands LLC]**
 - c. **[LG Electronics USA, Inc.; LG Electronics Inc.]**
 - d. **[Maytag; Whirlpool Corporation]**
 - e. **[Whirlpool Corporation]**
 - f. **<Insert manufacturer's name>**
3. Type: Freestanding washer/dryer unit with **[dual-drum design and electric dryer][dual-drum design and gas dryer][all-in-one, single-drum design];** washer is **[top][front]** loading.
4. Dimensions:
 - a. Width: **[23-1/2 inches (597 mm)][27 inches (686 mm)][As indicated on Drawings]<Insert dimension>.**
 - b. Depth: **[25 inches (635 mm)][32 inches (813 mm)][As indicated on Drawings]<Insert dimension>.**
 - c. Height: **[34-1/2 inches (876 mm)][71-1/2 inches (1816 mm)][As indicated on Drawings]<Insert dimension>.**
5. Washer and Dryer Drums: **[Manufacturer's standard][Perforated porcelain-enameled steel][Perforated stainless steel]<Insert material>.**
 - a. Washer-Drum Capacity: **[1.5 cu. ft. (0.04 cu. m)][2.0 cu. ft. (0.06 cu. m)][2.6 cu. ft. (0.07 cu. m)]<Insert volume>.**
 - b. Dryer-Drum Capacity: **[2.0 cu. ft. (0.06 cu. m)][3.4 cu. ft. (0.10 cu. m)][5.9 cu. ft. (0.17 cu. m)]<Insert volume>.**
6. Washer/Dryer Drum: **[Manufacturer's standard][Perforated stainless steel]<Insert material>.**
 - a. Drum Capacity: **[2.3 cu. ft. (0.07 cu. m)][3.6 cu. ft. (0.10 cu. m)]<Insert volume>.**
7. Washer Controls: **[Touch-pad][Rotary-dial]** controls for water-fill levels, wash/rinse water temperatures, **<Insert function,>** and variable-speed and fabric selectors.
8. Dryer Controls: **[Touch-pad][Rotary-dial]** controls for drying cycle, temperatures, **<Insert**

function,> and fabric selectors.

- a. Wash Cycles: **[Three]<Insert number>** wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: **[Three]<Insert number>** settings.
 - c. Speed Combinations: **[Two]<Insert number>**.
9. Electric Washer/Dryer Power: **[240 V, 60 Hz, 1 phase, 30 A][120 V, 60 Hz, 1 phase, 12 A][As indicated on Drawings]<Insert requirement>**.
 10. Gas Washer/Dryer Power: **[120 V, 60 Hz, 1 phase, 15 A electric; 22,000 Btu/h (6400 W) gas][As indicated on Drawings]<Insert requirement>**.
 11. Motor: Manufacturer's standard with built-in overload protector.
 12. Washing Features:
 - a. Self-cleaning lint filter.
 - b. Unbalanced-load compensator.
 - c. Inlet Hoses: Minimum length **60 inches (1525 mm)**.
 - d. Drain Hoses: Minimum length **48 inches (1220 mm)**.
 - e. Self-leveling legs.
 - f. Automatic dispenser for **[bleach][fabric softener][and][detergent]**.
 - g. Spin-cycle safety switch.
 - h. **<Insert feature>**.
 13. Drying Features:
 - a. Removable lint filter.
 - b. Electronic temperature and moisture-level-sensor controls.
 - c. End-of-cycle signal.
 - d. Interior drum light.
 - e. **<Insert feature>**.
 14. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
 15. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
 16. Appliance Finish: **[Enamel][Stainless steel]<Insert finish>**.
 - a. Color: **[White][Almond]<Insert color>**.

2.7 TRASH COMPACTORS

A. Trash Compactor : Complying with AHAM TC-1.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[GE Appliances; Haier Group]**
 - b. **[Jennair; Whirlpool Corporation]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[KitchenAid; Whirlpool Corporation]**
 - e. **[Maytag; Whirlpool Corporation]**
 - f. **[Viking Range, LLC; Middleby Corporation]**

- g. **[Whirlpool Corporation]**
 - h. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[GE Appliances; Haier Group]**
 - b. **[Jennair; Whirlpool Corporation]**
 - c. **[Kenmore; Transformco SR Brands LLC]**
 - d. **[KitchenAid; Whirlpool Corporation]**
 - e. **[Maytag; Whirlpool Corporation]**
 - f. **[Viking Range, LLC; Middleby Corporation]**
 - g. **[Whirlpool Corporation]**
 - h. **<Insert manufacturer's name>**
- 3. Type: **[Built in][Convertible]**.
- 4. Width: **[15 inches (381 mm)][18 inches (457 mm)]**.
- 5. Capacity: **[1.4 cu. ft. (0.04 cu. m)][1.7 cu. ft. (0.05 cu. m)]<Insert volume>**.
- 6. Features:
 - a. Key-operated starting switch.
 - b. Rear wheels.
 - c. Removable bag carrier.
 - d. Retainer for disposable bags.
 - e. Odor-control mechanism.
 - f. Foot-operated drawer operator.
 - g. **<Insert feature>**.
- 7. Front Panel: **[Manufacturer's standard][Wood panel to match kitchen cabinets][Enameled steel][Stainless steel][Wood-panel insert specified in Section 064100 "Architectural Wood Casework" to match kitchen cabinets][Wood-panel insert specified in Section 064101 "Architectural Wood Casework (NAAWS Standard)" to match kitchen cabinets][Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets]<Insert description>**.
 - a. Panel Color: **[White][Black]<Insert color(s)>**.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance

of residential appliances.

- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where **[overhead exhaust hoods][downdraft exhaust][and][microwave ovens with vented exhaust fans]** will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF RESIDENTIAL APPLIANCES

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 11 30 13 00



Task	Specification	Specification Description
11 30 13 13	11 30 13 00	Residential Appliances
11 30 13 23	11 30 13 00	Residential Appliances
11 30 33 00	01 11 19 00	No Specification Required



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SECTION 11 40 00 00 - FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fabricated equipment.
2. Food waste machines.
3. Cooking equipment.
4. Self-contained refrigeration equipment.
5. Walk-in refrigeration equipment.
6. Powered food-preparation equipment.
7. Warewashing equipment.
8. Serving equipment.
9. Utility distribution systems.

B. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment for installation by Contractor.

C. Related Requirements:

1. Section 233813 "Commercial-Kitchen Hoods" for ventilation hoods.

1.2 COORDINATION

A. Coordinate foodservice equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate locations and requirements of utility service connections.

C. Coordinate sizes, locations, and requirements of the following:

1. Overhead equipment supports.
2. Equipment bases.
3. Floor depressions.
4. Insulated floors.
5. Floor areas with positive slopes to drains.
6. Floor sinks and drains serving foodservice equipment.
7. Roof curbs, equipment supports, and penetrations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data

11 - Equipment

1. Fabricated equipment.
2. Food waste machines.
3. Cooking equipment.
4. Self-contained refrigeration equipment.
5. Walk-in refrigeration equipment.
6. Powered food-preparation equipment.
7. Warewashing equipment.
8. Serving equipment.
9. Utility distribution systems.

B. Include the following:

1. Manufacturer's model number.
2. Accessories and components that will be included for Project.
3. Clearance requirements for access and maintenance.
4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.

C. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each factory-applied color finish required, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For foodservice facilities.

1. Indicate locations of foodservice equipment and connections to utilities.
2. Key equipment using same designations as indicated on Drawings.
3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
4. Include details of seismic bracing for equipment.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For foodservice equipment to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Product Schedule: For each foodservice equipment item, include the following:
 - 1) Designation indicated on Drawings.
 - 2) Manufacturer's name and model number.
 - 3) List of factory-authorized service agencies including addresses and telephone numbers.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

1.8 WARRANTY

- A. Refrigeration Compressor Warranty: Manufacturer agrees to repair or replace compressors that fail in materials or workmanship within specified warranty period.
 - 1. Failure includes, but is not limited to, inability to maintain set temperature.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.
- B. BISSC Standards: Provide bakery equipment that complies with BISSC/Z50.2.
 - 1. Provide BISSC-certified equipment[, **with certification verified by a third-party agency**].
- C. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.
- D. Steam Equipment: Provide steam-generating and direct-steam heating equipment that is fabricated and labeled to comply with 2013 ASME Boiler and Pressure Vessel Code.
- E. Regulatory Requirements: Install equipment to comply with the following:
 - 1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
 - 2. NFPA 54, "National Fuel Gas Code."
 - 3. NFPA 70, "National Electrical Code."
 - 4. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."
- F. Seismic Restraints: Comply with SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines," Appendix A, "Seismic Restraint Details," unless otherwise indicated.

2.2 FABRICATED EQUIPMENT

- A. Stainless Steel Sinks :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: [One][Two][Three][Four]-compartment sink(s). Fabricate units of welded stainless steel, sound deadened.
 - a. Bowls: Stainless steel, Type 304, [0.078 inch (1.98 mm)][0.062 inch (1.59 mm)] thick.
 - b. Integral Drainboards: Stainless steel, Type 304, [0.078 inch (1.98 mm)][0.062 inch (1.59 mm)] thick.
 - c. Body: Stainless steel, [Type 304, 0.078 inch (1.98 mm)][Type 304, 0.062 inch (1.59 mm)][Type 430, 0.062 inch (1.59 mm)] thick.
 - 1) Back Splash: [Manufacturer's standard height][13 inches (330 mm)][18 inches (457 mm)]<Insert height>.
 - 2) Side Splash: [Manufacturer's standard height][13 inches (330 mm)][18 inches (457 mm)]<Insert height>.
 - d. Legs and Feet: Stainless steel tubing legs with adjustable bullet feet.
 - e. Accessories:
 - 1) Faucets and Spouts: <Insert requirements>.
 - 2) Prerinse Faucet: <Insert requirements>.
 - 3) Vacuum breaker.
 - 4) Lever waste[with overflow].
 - 5) Basket strainer.
 - 6) Continuous waste.
 - 7) Scrap trough.
 - 8) Control bracket for food waste disposer controls.
 - 9) Scrap block and hole.
 - 10) Stainless steel pot rack.
4. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
5. Fabrication: Prepare sink for installation of the following equipment items:
 - a. Water heater.
 - b. Food waste disposer; weld disposer cone or collar into sink.
 - c. Undercounter dishwasher.
 - d. <Insert equipment>.
6. Stainless Steel Finish: [Directional satin finish, ASTM A480/A480M, No. 4]<Insert finish>.

B. Stainless Steel Tables :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: **[Flat-countertop][Prep][Equipment-stand][Mixer-stand][Dish]<Insert description>** table.
 - a. Tops: Stainless steel, **[Type 304, 0.078 inch (1.98 mm)][Type 304, 0.062 inch (1.59 mm)][Type 430, 0.062 inch (1.59 mm)]** thick, reinforced and sound deadened.
 - 1) Back Splash: **[Manufacturer's standard height][1-1/2 inches (38 mm)][5 inches (127 mm)]<Insert height>**.
 - 2) Edge: **[Bullnose on four sides][Bullnose on front edge, straight on sides and back][Marine edge]<Insert requirements>**.
 - b. Welded Undershelf: **[Stainless steel, Type 304, 0.050 inch (1.27 mm) thick][Metallic-coated steel, 0.052-inch (1.32-mm) nominal thickness]**.
 - c. Adjustable Undershelf: **[Stainless steel, Type 304, 0.050 inch (1.27 mm) thick][Metallic-coated steel, 0.052-inch (1.32-mm) nominal thickness]**.
 - d. Crossbracing: **[Stainless steel][Metallic-coated steel]** tubing, **[bolted][welded]** to legs.
 - e. Cabinet:
 - 1) Body: Stainless steel, Type 430, **0.050 inch (1.27 mm)** thick.
 - 2) Doors: **[Sliding][Hinged]**, stainless steel, Type 304, **0.038 inch (0.95 mm)** thick.
 - 3) Drawers: **[Stainless steel drawer and faceplate][Galvanized-steel drawer and stainless steel faceplate][Stainless steel front and liner][Stainless steel front and galvanized-steel liner]<Insert requirements>**.
 - f. Sink: Stainless steel, Type 304, **0.078 inch (1.98 mm)** thick, welded into tabletop and including the following:
 - 1) Faucet and Spout: **<Insert requirements>**.
 - 2) Vacuum breaker.
 - 3) Leverwaste **[with overflow]**.
 - 4) Basket strainer.
 - 5) Tail piece.
 - g. Legs: **[Stainless steel][Metallic-coated steel]** tubing.
 - h. Feet: **[Stainless steel adjustable bullets][Plastic adjustable bullets][Stainless steel, flanged, adjustable bullets][Casters]<Insert requirements>**.
 - i. Accessories:
 - 1) Control panel.
 - 2) Control bracket for food waste disposer controls.
 - 3) Aluminum pan rack slides, **[six][three]** slides each.
 - 4) Urn trough.
 - 5) Spice bins.
4. Materials:
 - a. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
 - b. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with minimum **G90 (Z275)** coating.

5. Fabrication: Prepare table for installation of the following equipment items:
 - a. Food waste disposer; weld disposer cone or collar into sink.
 - b. Heat lamp.
 - c. **<Insert equipment>**.
6. Stainless Steel Finish: **[Directional satin finish, ASTM A480/A480M, No. 4]****<Insert finish>**.

C. Stainless Steel Shelf Units :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: **[Table mounted, single deck][Table mounted, double deck][Wall mounted]****<Insert description>**. Fabricate units of stainless steel, **[Type 304, 0.062 inch (1.59 mm)][Type 304, 0.050 inch (1.27 mm)][Type 430, 0.050 inch (1.27 mm)]** thick.
4. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
5. Stainless Steel Finish: **[Directional satin finish, ASTM A480/A480M, No. 4]****<Insert finish>**.

D. Pot Racks :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: **[Wall mounted][Ceiling hung][Corner]****<Insert description>**. Fabricate units of **[stainless steel][painted, cold-rolled steel]**.
 - a. Bars: **[Double][Single]**.
 - b. Hooks: **[18]****<Insert number>** per unit.
4. Materials:
 - a. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, Type 304.
 - b. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable

for exposed applications.

5. Finishes:

- a. Stainless Steel: **[Directional satin finish, No. 4]<Insert finish>**.
- b. Cold-Rolled Steel: Powder-coat painted finish.

E. Stainless Steel Hand Sinks :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: **[Lavatory]<Insert description>** sink. Fabricate units of stainless steel, Type 304, **[0.050 inch (1.27 mm)][0.038 inch (0.95 mm)]** thick.
 - a. Operation: **[Electronic][Knee valve][Foot pedal][Wrist handle][Handle]<Insert description>**.
 - b. Faucet and Spout: **<Insert requirements>**.
 - c. Accessories:
 - 1) Chrome-plated tail piece and P trap, **NPS 1-1/2 (DN 40)**, with **[0.045-inch (1.1-mm)]<Insert dimension>** minimum wall thickness.
 - 2) Strainer basket with metal post.
 - 3) Liquid soap dispenser, **[splash][deck]** mounted.
 - 4) Liquid soap and towel dispenser.
 - 5) Towel dispenser.
 - 6) Tubular wall supports.
 - 7) Skirt assembly for support.
 - 8) Side splashes.
4. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
5. Stainless Steel Finish: **[Directional satin finish, ASTM A480/A480M, No. 4]<Insert finish>**.

F. Floor Equipment : **[Troughs][Water receptacles]**.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. <Insert manufacturer's name>
3. Description: [4-inch (102-mm)][2-inch (50-mm)]<Insert dimension> nominal depth excluding tailpiece.
 - a. Body: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick.
 - b. Grate: [Stainless steel bar, Type 304][Fiberglass].
 - c. Waste Connection: NPS 3 (DN 80).
4. Materials:
 - a. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
 - b. Stainless Steel Bars: ASTM A276, austenitic stainless steel, type as indicated.
5. Stainless Steel Finish: [Directional satin finish, ASTM A480/A480M, No. 4]<Insert finish>.

2.3 FOOD WASTE MACHINES

A. Food Waste Disposer Units :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: [3][5][7] hp, with dual-direction shredding elements, and the following:
 - a. [Stainless steel][Corrosion-resistant] housing.
 - b. Flow control.
 - c. Solenoid valve.
 - d. Vacuum breaker.
 - e. Fixed nozzle.
 - f. Control Panel:
 - 1) Autoreversing and internal timed water flush.
 - 2) Stainless steel mounting bracket.
 - g. Prerinse: Backsplash mounted with hot- and cold-water mixing valve and with [stainless steel][corrosion-resistant] exposed metal parts and the following:
 - 1) Wall support bracket.
 - 2) Flexible, 3/8-inch (10-mm) metal-encased hose with a minimum length of 29 inches (737 mm) and supported by spiral spring.
 - 3) Spray-head assembly with lockable lever handle.

h. Accessories:

- 1) Collar adaptor for [sink][trough].
- 2) Cone with adaptor ring.
 - a) Size: [12 inches (305 mm)][15 inches (381 mm)][18 inches (457 mm)].
- 3) Cone cover in size that matches cone.
- 4) Silver accumulator.
- 5) <Insert requirements>.

i. Electrical Service: Equip unit for connection to [service indicated on Drawings]<Insert requirements>.

B. Food Waste Pulper and Water Extractor Systems :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: Stainless steel pulper unit, extractor unit, and control panel with water-level control and push-button start.
 - a. Capacity: Not less than [600 lb (272 kg)][700 lb (318 kg)][900 lb (408 kg)]<Insert value> of waste per hour.
 - b. Accessories:
 - 1) Feed trough connection.
 - 2) Feed tray.
 - 3) Feed hood assembly.
 - 4) Under-dish-table lid.
 - 5) Remote Water Extractor:
 - a) Dam, to prevent siphoning of water from pulper tank.
 - b) Remote piping system, [overhead][below floor].
 - 6) <Insert requirements>.
 - c. Electrical Service: Equip unit for connection to [service indicated on Drawings]<Insert requirements>.

C. Food Waste Grinder and Water Extractor Systems :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: Stainless steel construction, with off and on controls on unit, food waste hopper, silver saver, internal disposer, removable water extraction auger with internal water sprays, and discharge chute.
 - a. Capacity: Not less than [600 lb (272 kg)][700 lb (318 kg)]<Insert value> of waste per hour.
 - b. Accessories:
 - 1) Reel rinse unit with spray valve.
 - 2) Recirculation water pump.
 - 3) Trough mount.
 - c. Electrical Service: Equip unit for connection to [service indicated on Drawings]<Insert requirements>.

D. Undercounter Food Waste Grinder and Water Extractors :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: Stainless steel, undercounter, cleanable assembly including the following:
 - a. Capacity: Not less than [600 lb (272 kg)][700 lb (318 kg)]<Insert value> of waste per hour.
 - b. Separate water-extractor and disposer units.
 - 1) Disposer: Corrosion-resistant housing, dual-direction shredding elements.
 - c. Piping between disposer and water extractor.
 - d. Vacuum breaker.
 - e. Solenoid valve.
 - f. Flow control.
 - g. Time-delayed relay.
 - h. Control Panel:

- 1) Autoreversing and internal timed water flush.
- 2) Stainless steel mounting bracket.
- i. Prerinse: Backsplash mounted with hot- and cold-water mixing valve and with **[stainless steel][corrosion-resistant]** exposed metal parts and the following:
 - 1) Wall support bracket.
 - 2) Flexible, **3/8-inch (10-mm)** metal-encased hose with a minimum length of **29 inches (737 mm)** and supported by spiral spring.
 - 3) Spray-head assembly with lockable lever handle.
- j. Accessories:
 - 1) Cone with adaptor ring.
 - a) Size: **[12 inches (305 mm)][15 inches (381 mm)][18 inches (457 mm)]**.
 - 2) Cone cover in size that matches cone.
 - 3) Silver sorter.
 - 4) Trough collar connection.
- k. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.

2.4 COOKING EQUIPMENT

A. Ranges :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description:
 - a. Top Configuration:
 - 1) Open-Burner Unit:
 - a) Standard Burners: **[Four][Six][Eight][Four, step-up type]<Insert requirements>**.
 - b) **[Wok][Saute]** Head: **<Insert requirements>**.
 - 2) Griddle: **[Flat][Raised]**.
 - 3) Radiant Broiler: **<Insert requirements>**.

- b. Base Configuration:
 - 1) Standard Oven(s): **[One][Two]**.
 - 2) Convection Oven(s): **[One][Two]**.
 - 3) Storage Base: One.
- c. Accessories:
 - 1) **[High][Double-deck]** back shelf.
 - 2) Stainless steel sides.
 - 3) Stainless steel back.
 - 4) Legs for curb base.
 - 5) Toe Base: **4 inches (102 mm)** high.
 - 6) Casters: **<Insert requirements>**.
 - 7) Oven Rack(s): **[One]<Insert number>** for each oven.
- d. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.
- e. Gas Service: **[Natural][Liquefied propane]** gas.

B. Deep Fat Fryers :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
- 3. Description: **[Electric fryer, solid-state controls][Electric, programmable computer controls][Gas fryer]<Insert description>**.
 - a. Oil Capacity: **[40 lb (18 kg)][85 lb (39 kg)]<Insert value>**.
 - b. Accessories:
 - 1) Stainless steel sides.
 - 2) Stainless steel fry tank.
 - 3) Stainless steel fry tank cover.
 - 4) Casters: **<Insert requirements>**.
 - 5) Automatic basket lifts.
 - 6) Single Fry Baskets: **<Insert quantity>**.
 - 7) Twin Fry Baskets: **<Insert quantity>**.
 - 8) Triple Fry Baskets: **<Insert quantity>**.
 - 9) Quick gas-service disconnect and flexible hose.
 - 10) **<Insert requirements>**.
 - c. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.
 - d. Gas Service: **[Natural][Liquefied propane]** gas.

C. Steam Jacketed Kettles :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: Stainless Steel, Type 304.
 - a. Type: **[Stationary][Tilting]**.
 - b. Steam Source: **[Electrically heated, self-contained][Direct]**.
 - 1) **[Maximum][Operating]** Steam Pressure: **[50 psig (345 kPa)][25 psig (172 kPa)]<Insert value>**.
 - c. Capacity: **[10 quarts (9.5 L)][20 gal. (76 L)]<Insert value>**.
 - d. Accessories:
 - 1) Basket insert.
 - 2) Lift-off cover.
 - 3) **[Single][Double]**-pantry water filler.
 - 4) Tangent Drawoff: **[2 inches (50 mm)][3 inches (76 mm)]<Insert requirements>**.
 - 5) Disc Strainer: **1/8 inch (3 mm), [perforated][solid]**.
 - 6) Interior Finish: **[Manufacturer's standard][Stainless steel, Type 316]**.
 - 7) Cold-water jacket cooling.
 - 8) Steam trap assemblies.
 - 9) Kettle brush kit.
 - 10) **<Insert requirements>**.
 - e. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.
4. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
5. Stainless Steel Finish: **[Directional satin finish, ASTM A480/A480M, No. 4]<Insert finish>**.

D. Ovens :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. <Insert manufacturer's name>
3. Description: [Electric convection][Gas convection][Rotisserie]<Insert description>.
 - a. [Single deck][Double deck][Single deck with open stand]<Insert requirements>.
 - b. Accessories:
 - 1) Oven Rack(s): [One]<Insert number> per oven chamber.
 - 2) Stainless steel drip pan.
 - 3) Down-draft flue diverter.
 - 4) Stacking kit.
 - c. Electrical Service: Equip unit for connection to [service indicated on Drawings]<Insert requirements>.
 - d. Gas Service: [Natural][Liquefied propane] gas.

E. Microwave Ovens :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: 1200 W cooking power.
 - a. Electrical Service: Equip unit with plug and cord for 120 V service.

F. Coffee Urns :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: [Single][Twin][Triple] urn.
 - a. Capacity: [3 gal. (11 L)][6 gal. (23 L)][10 gal. (38 L)] per liner.
 - b. Type: [Electric][Gas][Steam] heated.

- c. Agitator: **[Automatic][Push button]**.
- d. Spray Arm: **[With][Without]** bypass.
- e. Timer: **[Digital][Electromechanical]**.
- f. Accessories:
 - 1) Fill/Dispense: **<Insert requirements>**.
 - 2) Multiple Faucet: **<Insert requirements>**.
 - 3) Filtering: **[Permanent, stainless steel, woven-wire cloth][Disposable filter paper]**.
 - 4) Finish: **[Manufacturer's standard][Brass body and trim][Copper body and brass trim]<Insert finish>**.
- 4. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.
- 5. Gas Service: **[Natural][Liquefied propane]** gas.
- 6. Operating Steam Pressure: **[As indicated on Drawings]<Insert pressure>**.

2.5 SELF-CONTAINED REFRIGERATION EQUIPMENT

A. Refrigeration Equipment : **[Refrigerators][Freezers]**.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
- 3. Description: **[Reach-in][Roll-in][Pass-through]** type.
 - a. Exterior Finish: Stainless steel.
 - b. Interior Finish: **[Stainless steel][Manufacturer's standard]**.
 - c. Doors: **[Full length][Half-length][In configuration shown on Drawings]**.
 - d. Accessories:
 - 1) Casters.
 - 2) Stainless steel back with rear louvers.
 - 3) Re-hinging feature for doors.
 - 4) Hinged glass doors and fluorescent fixtures.
 - 5) Tray Slides: For **<Insert description>** sheet pans.
 - 6) **[Chrome-Plated][Stainless steel]** Shelves: **<Insert quantity>**.
 - 7) Loading Rack: **<Insert requirements>**.
 - 8) Transfer Carriage: **<Insert requirements>**.
 - e. Electrical Service: Equip unit with plug and cord for **[service indicated on Drawings]<Insert requirements>**.

B. Undercounter Refrigeration Equipment : **[Refrigerators][Freezers]**.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: Compact unit with rear-mounted, self-contained refrigeration system.
 - a. Accessories:
 - 1) Stainless steel top with backsplash.
 - 2) Stainless steel back panel.
 - 3) Casters: **[6 inches (152 mm)][4 inches (102 mm)][3-1/2 inches (89 mm)]** high.
 - 4) Utility Base: **6 inches (152 mm)** high.
 - 5) Shelves: **<Insert description and quantity>**.
 - 6) Stacking kit.
 - b. Electrical Service: Equip unit with plug and cord for **[service indicated on Drawings]<Insert requirements>**.

C. Merchandiser Refrigeration Units :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
3. Description: **[Curved-glass, self-contained refrigerator][Sliding-glass, self-contained refrigerator][Sliding-glass, self-contained freezer]<Insert description>**.
 - a. Exterior Finish: **[Manufacturer's standard][Stainless steel]<Insert requirements>**.
 - b. Interior Finish: **[Manufacturer's standard][Stainless steel][White]<Insert requirements>**.
 - c. Accessories:
 - 1) Door locks.
 - 2) Fluorescent Light Fixtures: **<Insert quantity>**.
 - 3) Base: **<Insert requirements>**.
 - 4) Casters: **<Insert requirements>**.
 - 5) Legs: **<Insert requirements>**.

6) Chrome-Plated Shelves: **<Insert quantity>**.

d. Electrical Service: Equip unit with plug and cord for **[service indicated on Drawings]<Insert requirements>**.

D. Ice-Making Machine :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

a. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

a. **<Insert manufacturer's name>**

3. Description: **[Undercounter][Freestanding]** units.

a. Production: Ice **[cubes][cubes, dice][cubes, half-dice][flakes][chipelets (compacted flake ice)]**.

b. Capacity: **<Insert lb (kg)>** per 24-hour period.

c. Accessories:

1) Storage Bin: **<Insert requirements>**.

a) Storage Capacity: **<Insert lb (kg)>**.

2) Stainless steel stand and legs.

3) Water filter.

d. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.

2.6 WALK-IN REFRIGERATION EQUIPMENT

A. Walk-in Refrigeration Units :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

a. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

a. **<Insert manufacturer's name>**

3. Description: **[Cooler][Freezer][Two-compartment unit, with cooler and freezer compartments]<Insert description>.**
 - a. Wall and Ceiling Panels: Interlocking insulating panels.
 - b. Floors: **[Insulated floor panels][Field installed; provide manufacturer's standard insulated floor screed]<Insert requirements>.**
 - c. Doors:
 - 1) Hinges: **[Two per door][Self-closing and spring loaded; three per door]<Insert requirements>.**
 - 2) Latch: **[Edge-mounted, positive-type latch with cylinder lock]<Insert requirements>.**
 - 3) Include safety-release handle that opens door from inside when door is locked.
 - d. Door Accessories:
 - 1) Vision port.
 - 2) Pressure relief port.
 - 3) Threshold: Stainless steel, factory installed.
 - 4) Antic condensate heater at freezer doors.
 - e. Vaporproof Lighting Fixtures: **<Insert requirements>.**
 - 1) Control: Neon pilot light and toggle switch located on exterior of door panel.
 - 2) Quantity: **[One per compartment, located on door panel]<Insert quantity>.**
 - f. Refrigeration System: **[Self-contained, mounted on unit][Remote system with preassembled condensing unit and evaporator assemblies]<Insert requirements or manufacturer's refrigeration assembly designation>.**
 - 1) Exterior Condensing Units: Include winter control, crankcase heater, and enclosed weatherproof housing.
 - 2) Operating Temperature: **<Insert value(s)>.**
 - g. Temperature Monitoring System: **[Electronic monitoring and remote audible alarm system that warns when temperatures register 10 deg F (6 deg C) above or below set temperature]<Insert requirements>.**
 - h. Closure Panels and Trim: **[Include closure panels and trim]<Insert requirements>.**
 - i. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>.**
4. Finishes:
 - a. Exposed Exterior Finish: **[Stucco-patterned aluminum][Smooth, mill-finished aluminum][White-painted aluminum]<Insert requirements>.**
 - b. Unexposed Exterior Finish: **[Stucco-patterned, metallic-coated steel]<Insert requirements>.**
 - c. Interior Finish: **[Stucco-patterned aluminum][Smooth, mill-finished aluminum][White-painted aluminum]<Insert requirements>.**
 - d. Closure Panels and Trim: **[Matched to exposed exterior finish of panels]<Insert requirements>.**

2.7 POWERED FOOD-PREPARATION EQUIPMENT

- A. Food-Preparation Equipment : **[Mixers][Slicers][Meat saws][Peelers]<Insert description>**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
 3. Description: **<Insert requirements>**.
 4. Accessories: **<Insert accessories>**.
 5. Electrical Service: Equip unit with plug and cord for **[service indicated on Drawings]<Insert requirements>**.

2.8 WAREWASHING EQUIPMENT

- A. Warewashing Machines :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
 3. Description: **[Dishwashing, single tank][Dishwashing, double tank][Dishwashing, rackless conveyor][Dishwashing, with circular conveyor table][Pot and pan washing, two racks][Pot and pan washing, one rack]<Insert description>**.
 - a. Capacity: **<Insert requirements>**.
 - b. Accessories: **<Insert accessories>**.
 - c. Electrical Service: Equip unit for connection to **[service indicated on Drawings]<Insert requirements>**.

2.9 SERVING EQUIPMENT

- A. Modular Counters :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: [Hot food][Refrigerated salad][Ice-cooled salad][Sliding-glass door refrigerated][Frost-top][Sandwich][Pizza][Refrigerated-chest][Dual-temperature][Tray-starter][Storage][Cashier]<Insert description> module.
 - a. Cabinet Face Panels: [Manufacturer's standard]<Insert requirements>.
 - b. Accessories:
 - 1) Tray slide.
 - 2) Work shelf.
 - 3) Casters.
 - 4) Electrical receptacle.
 - 5) Cam-action latch locks with trigger release to mate with adjoining modular counters.
 - 6) Tempered-glass, food-protector shield.
 - c. Electrical Service: Equip unit for connection to [service indicated on Drawings]<Insert requirements>.
 - d. Color: [As selected by Architect from manufacturer's full range]<Insert color>.

2.10 UTILITY DISTRIBUTION SYSTEMS

A. Utility Distribution Systems :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Description: [Overhead][Counter][Island][Tray-slide][Steam][Wall-mounted] system.
4. Accessories: <Insert accessories>.

2.11 MISCELLANEOUS MATERIALS

- A. Installation Accessories, General: NSF certified for end-use application indicated.
- B. Elastomeric Joint Sealant: ASTM C920; silicone. Type S (single component), Grade NS (nonsag), Class 25, Use NT (nontraffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.
 - 1. Public Health and Safety Requirements:
 - a. Sealant is certified for compliance with NSF standards for end-use application indicated.
 - b. Washed and cured sealant complies with the FDA's regulations for use in areas that come in contact with food.
 - 2. Cylindrical Sealant Backing: ASTM C1330, Type C, closed-cell polyethylene, in diameter greater than joint width.

2.12 FINISHES

- A. Stainless Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Powder-Coat Finishes: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install foodservice equipment level and plumb, according to manufacturer's written instructions.
 - 1. Connect equipment to utilities.
 - 2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- B. Complete equipment assembly where field assembly is required.
 - 1. Provide closed butt and contact joints that do not require a filler.
 - 2. Grind field welds on stainless steel equipment until smooth and polish to match adjacent finish.
- C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.
- D. Install cabinets and similar equipment on bases in a bed of sealant.

11 - Equipment

- E. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.
- F. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

- A. After completing installation of equipment, repair damaged finishes.
- B. Clean and adjust equipment as required to produce ready-for-use condition.
- C. Protect equipment from damage during remainder of the construction period.

3.3 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain foodservice equipment.

END OF SECTION 11 40 00 00



Task	Specification	Specification Description
11 41 00 00	11 40 00 00	Foodservice Equipment
11 41 13 00	11 40 00 00	Foodservice Equipment
11 41 23 00	11 40 00 00	Foodservice Equipment
11 41 31 00	11 40 00 00	Foodservice Equipment



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SECTION 11 41 33 00 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Residential stock cabinets.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 123623.13 "Plastic-Laminate-Clad Countertops."
4. Section 123640 "Stone Countertops."
5. Section 123661 "Simulated Stone Countertops."

1.2 DEFINITIONS

- A. Concealed Surfaces of Casework:** Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of casework installed directly against and completely concealed by walls or other casework, and tops of wall cabinets and utility cabinets.
- B. Exposed Surfaces of Casework:** Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- C. Semiexposed Surfaces of Casework:** Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.

1.3 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.**

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles and finishes for casework.
2. Include rated capacities, operating characteristics, profiles, and finishes for hardware.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means

- of transportation, and cost for each indigenous material.
- 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- 4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- 5. Laboratory Test Reports: For adhesives, indicating compliance with VOC requirements in the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 6. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 7. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.

C. Shop Drawings:

- 1. Include plans, elevations, details, and attachments to other work.
- 2. Show materials, finishes, filler panels, and hardware.
- 3. Indicate manufacturer's catalog numbers for casework.

D. Samples: For casework and hardware finishes.

E. Samples for Initial Selection: For casework and hardware finishes.

F. Samples for Verification: For the following:

- 1. Casework Finishes: **8-by-10-inch (200-by-250-mm)** Samples for each type of casework finish.
- 2. Hardware: One full-size Sample of each type of exposed hardware in each finish required.
- 3. Base Cabinet: One full-size, [**16-inch- (406-mm-)**]**<Insert dimension>** wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
- 4. Wall Cabinet: One full-size, [**12-inch- (304-mm-)**]**<Insert dimension>** wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
- 5. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For casework.

1.6 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice, including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: Provide proof of use of vendors that are certified for chain of custody by an FSC-accredited certification body.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels

planned for building occupants during the remainder of the construction period.

- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
- C. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
 - 1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 RESIDENTIAL STOCK CABINETS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- 1. **[American Woodmark Corp.]**
- 2. **[Avon Cabinet Corp]**
- 3. **[AyA Kitchens & Baths, Ltd]**
- 4. **[Barbosa Cabinets, Inc]**
- 5. **[Bertch Cabinet Mfg., Inc]**
- 6. **[Bishop Cabinets]**
- 7. **[Brighton Cabinetry, Inc]**
- 8. **[Cabinet Craft LLC]**
- 9. **[Cabinetry by Karman]**
- 10. **[Cabinetworks Group]**
- 11. **[Canyon Creek Cabinet Company]**
- 12. **[Cardell Cabinetry; Cabinetworks Group]**
- 13. **[Countryside Cabinets; a brand of De Pere Cabinet, Inc.]**
- 14. **[Croton Kitchens Inc]**
- 15. **[Dwyer Products]**
- 16. **[Evans Cabinet Corporation]**
- 17. **[Fertig's Cabinet Company, Inc]**
- 18. **[Founder's Choice, Inc]**
- 19. **[Freudel Kitchens Limited]**
- 20. **[Haas Cabinet Co., Inc]**
- 21. **[Homecrest; a subsidiary of MasterBrand]**
- 22. **[Ideal Cabinetry]**
- 23. **[Kitchen Cabinets Incorporated]**
- 24. **[Kitchen Compact, Inc.]**
- 25. **[KitchenCraft Cabinetry; a subsidiary of MasterBrand]**
- 26. **[Kountry Wood Products]**
- 27. **[KraftMaid; Cabinetworks Group]**
- 28. **[Kunal Kitchens, LLC]**
- 29. **[Lanz Cabinets Incorporated]**
- 30. **[Leedo Cabinetry]**
- 31. **[Legacy Cabinets Inc.]**
- 32. **[Legacy Crafted Cabinets]**

33. [Master WoodCraft Cabinetry LLC; Cabinetnetworks Group]
34. [MasterBrand Cabinets, Inc.]
35. [Medallion Cabinetry, Inc.; Cabinetnetworks Group]
36. [Merillat Cabinetry; Cabinetnetworks Group]
37. [Mid Continent Cabinetry; MasterBrand Cabinet]
38. [Mid-America Cabinets.]
39. [Rosebud Wood Products]
40. [Saco Industries, Inc]
41. [Smart Cabinetry; Cabinetnetworks Group]
42. [Wellborn Forest Products, Inc]
43. [Wolf Home Products]
44. [Woodmont Cabinetry]
45. [Yorktowne; Cabinetnetworks Group]
46. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [American Woodmark Corp.]
2. [Avon Cabinet Corp]
3. [AyA Kitchens & Baths, Ltd]
4. [Barbosa Cabinets, Inc]
5. [Bertch Cabinet Mfg., Inc]
6. [Bishop Cabinets]
7. [Brighton Cabinetry, Inc]
8. [Cabinet Craft LLC]
9. [Cabinetry by Karman]
10. [Cabinetnetworks Group]
11. [Canyon Creek Cabinet Company]
12. [Cardell Cabinetry; Cabinetnetworks Group]
13. [Countryside Cabinets; a brand of De Pere Cabinet, Inc.]
14. [Crotone Kitchens Inc]
15. [Dwyer Products]
16. [Evans Cabinet Corporation]
17. [Fertig's Cabinet Company, Inc]
18. [Founder's Choice, Inc]
19. [Freindel Kitchens Limited]
20. [Haas Cabinet Co., Inc]
21. [Homecrest; a subsidiary of MasterBrand]
22. [Ideal Cabinetry]
23. [Kitchen Cabinets Incorporated]
24. [Kitchen Kompact, Inc.]
25. [KitchenCraft Cabinetry; a subsidiary of MasterBrand]
26. [Kountry Wood Products]
27. [KraftMaid; Cabinetnetworks Group]
28. [Kunal Kitchens, LLC]
29. [Lanz Cabinets Incorporated]
30. [Leedo Cabinetry]
31. [Legacy Cabinets Inc.]
32. [Legacy Crafted Cabinets]
33. [Master WoodCraft Cabinetry LLC; Cabinetnetworks Group]
34. [MasterBrand Cabinets, Inc.]
35. [Medallion Cabinetry, Inc.; Cabinetnetworks Group]
36. [Merillat Cabinetry; Cabinetnetworks Group]
37. [Mid Continent Cabinetry; MasterBrand Cabinet]

38. [Mid-America Cabinets.]
 39. [Rosebud Wood Products]
 40. [Saco Industries, Inc]
 41. [Smart Cabinetry; Cabinetworks Group]
 42. [Wellborn Forest Products, Inc]
 43. [Wolf Home Products]
 44. [Woodmont Cabinetry]
 45. [Yorktowne; Cabinetworks Group]
 46. <Insert manufacturer's name>
- C. Quality Standard: Provide cabinets that comply with KCMA A161.1.
1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with KCMA A161.1.
- D. Regional Materials: Verify the following wood products are manufactured within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
1. Interior trim.
 2. Fire-rated interior door[**and sidelight**] frames.
 3. Interior [**plywood**][**hardboard**][**board**] paneling.
 4. Shelving[**and clothes rods**].
 5. Interior [**stairs**][**and**][**railings**].
- E. Regional Materials: Verify the following wood products are manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
1. Interior trim.
 2. Fire-rated interior door[**and sidelight**] frames.
 3. Interior [**plywood**][**hardboard**][**board**] paneling.
 4. Shelving[**and clothes rods**].
 5. Interior [**stairs**][**and**][**railings**].
- F. Certified Wood: Verify product is certified as "FSC Pure"[**or "FSC Mixed Credit"**] in accordance with FSC STD-01-001 and FSC STD-40-004.
- G. Certified Wood: Verify product is labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- H. Certified Wood: Verify product is certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- I. Door and Drawer Face Style: [**Flush overlay; faces cover cabinet fronts**][**Reveal overlay; faces partially cover cabinet fronts**][**Lipped overlay; faces rabbeted and partially inset within cabinet fronts, lips of rabbets overlap cabinet fronts**][**Flush inset; faces set within and flush with cabinet fronts**].
1. Door and Drawer Fronts:
 - a. Solid-wood stiles and rails, **5/8 inch (16 mm)** thick, with **3/4-inch- (19-mm-)** thick, solid-wood center panels.

- b. Solid-wood stiles and rails, **3/4 inch (19 mm)** thick, with **1/4-inch- (6.4-mm-)** thick, veneer-faced plywood center panels.
 - c. **1/2-inch- (13-mm-)** thick, veneer-faced plywood.
 - d. **1/2-inch- (13-mm-)** thick, plastic-laminate-faced particleboard[, **with continuous solid-wood pulls on one edge**][, **with PVC edgebanding**].
 - e. **1/2-inch- (13-mm-)** thick, thermally fused laminate panels[, **with continuous solid-wood pulls on one edge**].
 - f. **1/2-inch- (13-mm-)** thick, thermoformed-vinyl-faced panels with vinyl overlay on [**faces and edges and with thermally fused laminate panel backs**][**faces, backs, and edges**].
- J. Cabinet Style: [**Face frame**][**Frameless**].
 1. Face Frames:
 - a. **3/4-by-1-5/8-inch (19-by-41-mm)** solid wood[**with glued mortise and tenon or doweled joints**].
 - b. **5/8-inch- (16-mm-)** thick particleboard with plastic laminate on exposed and semiexposed surfaces.
 - c. **5/8-inch- (16-mm-)** thick, thermally fused laminate panel material.
 - d. **1/2-inch- (13-mm-)** thick, thermoformed-vinyl-faced panels with vinyl overlay on exposed and semiexposed surfaces.
- K. Exposed Cabinet End Finish: [**Wood veneer**][**Plastic laminate**][**Thermally fused laminate panels**][**Thermoformed-vinyl-faced panels**].
- L. Cabinet End Construction: [**5/8-inch- (16-mm-)** thick particleboard or **1/2-inch- (13-mm-)** thick plywood][**1/2-inch- (13-mm-)** thick particleboard or **3/8-inch- (9.5-mm-)** thick plywood].
- M. Cabinet Tops and Bottoms: [**5/8-inch- (16-mm-)** thick particleboard or **1/2-inch- (13-mm-)** thick plywood][**1/2-inch- (13-mm-)** thick particleboard or **3/8-inch- (9.5-mm-)** thick plywood].
 1. Fully support in rabbets in and secure to end panels[, **front frame**,] and back rail.
- N. Back, Top, and Bottom Rails: **3/4-by-2-1/2-inch (19-by-63-mm)** solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- O. Wall-Hung-Unit Back Panels: **3/16-inch- (4.8-mm-)** thick plywood fastened to rear edge of end panels and to top and bottom rails.
- P. Base-Unit Back Panels: [**3/16-inch- (4.8-mm-)** thick plywood][**1/8-inch- (3.2-mm-)** thick hardboard] fastened to rear edge of end panels and to top and bottom rails.
- Q. Front Frame Drawer Rails: **3/4-by-1-1/4-inch (19-by-32-mm)** solid wood mortised and fastened into face frame.
- R. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 1. Join subfronts, backs, and sides with [**glued rabbeted joints supplemented by mechanical fasteners**][or][**glued dovetail joints**].
 2. Subfronts, Backs, and Sides: [**3/4-inch- (19-mm-)** thick solid wood][**1/2-inch- (13-mm-)** thick solid wood][**1/2-inch- (13-mm-)** thick solid wood or **3/8-inch- (9.5-mm-)** thick plywood].
 3. Bottoms: [**1/4-inch- (6.4-mm-)** thick plywood][**3/16-inch- (4.8-mm-)** thick plywood][**1/4-inch- (6.4-mm-)** thick hardboard].

- S. Shelves: [3/4-inch- (19-mm-) **thick particleboard or 5/8-inch- (16-mm-) thick plywood**][5/8-inch- (16-mm-) **thick particleboard or 1/2-inch- (13-mm-) thick plywood**].
- T. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- U. Factory Finishing: Finish cabinets at factory.

2.2 CABINET MATERIALS

- A. Hardwood Lumber: Kiln dried to 7 percent moisture content.
- B. Softwood Lumber: Kiln dried to 10 percent moisture content.
- C. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- D. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- E. Hardwood Plywood: HPVA HP-1.
- F. Particleboard: ANSI A208.1, Grade M-2.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
- G. MDF: Medium-density fiberboard, ANSI A208.2, Grade MD.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
- H. Hardboard: ANSI A135.4, Class 1 tempered.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
- I. Adhesives: Use adhesives that comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Adhesives: Do not use adhesives that contain urea formaldehyde.
- K. Exposed Materials:
 - 1. Exposed Wood Species: [**Oak**][**Maple**][**Alder**][**Birch**][**Hickory**][**Cherry**][**Manufacturer's standard domestic hardwood species**]**<Insert requirements>**.

- a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]**.
 2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
 3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with **[a minimum of 1/8-inch- (3-mm-) thick, solid-wood][veneer]** edging of same species as face veneer.
 4. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with ISO 4586, Grade VGS and edgebanded.
 - a. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
 - b. Plastic-Laminate Edgebanding: Of same grade, pattern, color, and texture of plastic laminate as for faces.
 - c. PVC Edgebanding: Rigid PVC extrusions, through color with satin finish, **[3 mm thick at doors and drawer fronts, and 1 mm thick elsewhere][1 mm thick]**.
 - 1) Color: **[As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
 5. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.
 - a. Provide material finished on both sides for doors and drawer fronts.
 - b. Provide **[PVC or polyester edgebanding][PVC edge molding]** on components with exposed or semiexposed edges.
 - c. Colors: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
 6. Thermoformed-Vinyl-Faced Panels: MDF, milled to required shapes, with a thermoformed vinyl overlay applied in a vacuum or membrane press.
 - a. Color: **[White][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
- L. Semiexposed Materials: Unless otherwise indicated, provide the following:
1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces **[or stained to be compatible with exposed surfaces]**.
 2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces **[or stained to be compatible with exposed surfaces]**.
 3. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with ISO 4586, Grade VGS.
 - a. For backs of doors and drawer fronts faced with plastic laminate, provide same grade, pattern, color, and texture of plastic laminate as for faces.

- b. For face frames faced with plastic laminate, provide plastic-laminate edges of same grade, pattern, color, and texture of plastic laminate as for faces.
 - c. For shelves faced with plastic laminate, provide **[plastic-laminate edges of same grade, pattern, color, and texture of plastic laminate as for faces][PVC edge molding, 1 mm thick]**.
 - d. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
- 4. Thermally Fused Laminate Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.
 - a. Provide material finished on both sides for shelves, dividers, drawer bodies, and other components with two semiexposed surfaces.
 - b. Provide **[PVC or polyester edgebanding][PVC edge molding]** on components with semiexposed edges.
 - c. Colors: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
- 5. Vinyl-Faced Particleboard: MDF with **[embossed, wood-grain-patterned]** vinyl film adhesively bonded to particleboard.
 - a. Provide vinyl film on both sides of shelves, dividers, drawer bodies, and other components with two semiexposed surfaces and on semiexposed edges.
 - b. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from cabinet manufacturer's full range]<Insert requirements>**.
- M. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish **[as indicated by manufacturer's designations][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert requirements>**.
- B. Pulls: **[Surface-mounted decorative pulls][Back-mounted decorative pulls][Back-mounted decorative pulls with backing plates][Wire pulls][Back-mounted knobs][Surface-mounted porcelain knobs]<Insert requirements>**.
- C. Hinges: **[Decorative full-surface hinges][Concealed butt hinges][Semiconcealed (wraparound) butt hinges for overlay doors][Pivot (knife) hinges][Concealed European-style, self-closing hinges]<Insert requirements>**.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.
- E. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.
 - 1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
 - 2. Drawers: Provide one bumper on back side of drawer front at each corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF RESIDENTIAL CASEWORK

- A. Install casework with no variations in adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework.
- B. Install casework without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of **1/8 inch in 8 ft. (3 mm in 2.4 m)**.
- D. Fasten casework to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, and at ends not more than **16 inches (400 mm) o.c.**
 - a. Fasteners: **[No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips][No. 10 wafer-head sheet metal screws through the metal backing or metal framing behind the wall finish][Toggle bolts through the metal backing or metal framing behind the wall finish].**

3.3 ADJUSTING AND CLEANING

- A. Adjust hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 11 41 33 00



Task	Specification	Specification Description
11 41 33 00	11 40 00 00	Foodservice Equipment
11 42 00 00	11 40 00 00	Foodservice Equipment
11 42 13 00	11 40 00 00	Foodservice Equipment
11 42 16 00	11 40 00 00	Foodservice Equipment
11 42 23 00	11 40 00 00	Foodservice Equipment
11 44 00 00	11 40 00 00	Foodservice Equipment
11 44 13 00	11 40 00 00	Foodservice Equipment
11 44 16 00	11 40 00 00	Foodservice Equipment
11 44 19 00	11 40 00 00	Foodservice Equipment
11 46 00 00	11 40 00 00	Foodservice Equipment
11 46 13 00	11 40 00 00	Foodservice Equipment
11 46 16 00	11 40 00 00	Foodservice Equipment
11 46 19 00	11 40 00 00	Foodservice Equipment
11 46 83 00	11 40 00 00	Foodservice Equipment
11 48 00 00	11 40 00 00	Foodservice Equipment
11 48 13 00	11 40 00 00	Foodservice Equipment
11 48 16 00	11 40 00 00	Foodservice Equipment



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SECTION 11 51 00 00 - LIBRARY STACK SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel-bracket shelving.
2. Wood-case shelving.
3. Steel-case shelving.
4. Steel four-post shelving.

B. Related Requirements:

1. **[Section 064100 "Architectural Wood Casework"]**[**Section 064101 "Architectural Wood Casework (NAAWS Standard)**] for custom-fabricated library shelving, end panels, and canopy tops.
2. Section 105613 "Metal Storage Shelving" for metal storage shelving for retail, commercial, and industrial uses.
3. Section 105626 "Mobile Storage Shelving" for shelving units mounted on wheeled carriages that roll back and forth on a track system.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for library stack systems and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Show clear-aisle widths from face of units.
3. Detail fabrication and installation of library stack systems, including methods of anchoring them to building structures at locations recommended by manufacturer[**and as required for seismic restraint**].

C. Samples: For each exposed product and for each color and texture specified, [6 inches (152 mm)]<Insert dimension> in size.

D. Samples for Initial Selection: For units with factory-applied finishes, [6 inches (152 mm)]<Insert dimension> in size.

E. Samples for Verification: For the following products, one of each, in manufacturer's standard[full] sizes:

1. Flat shelving.
2. Each type of specialized shelving.
3. End panels.
4. Top panels.
5. <Insert product>.

11 - Equipment

F. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.
3. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Design Calculations: For seismic design of library stack systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Data: For Installer.
- C. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For library stack systems to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Shelf Units: **[Five]<Insert number>** percent of quantity installed for each size and type indicated, but no fewer than **[10]<Insert number>** units.

1.6 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice, including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: Provide proof of use of vendors that are certified for chain of custody by an FSC-accredited certification body.
- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wood shelving until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of library stack systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal finishes and other materials beyond normal wear.
 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Library stack systems are to withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
1. Loads as indicated on Drawings.

2.2 STEEL-BRACKET SHELVING

- A. Steel-Bracket Shelving: ANSI Z39.73 shelving designed for library use, consisting of two uprights and two spreaders per section forming a four-sided frame, with adjustable shelves on one or both sides of uprights cantilever-hung by brackets.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Borroughs Corporation]**
 - b. **[Demco, Inc.]**
 - c. **[Library Bureau Steel]**
 - d. **[MJ Industries]**
 - e. **[Montel Inc.]**
 - f. **[Spacefile International Corp.]**
 - g. **[Spacesaver Corporation]**
 - h. **[Tennsco]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Borroughs Corporation]**
 - b. **[Demco, Inc.]**
 - c. **[Library Bureau Steel]**
 - d. **[MJ Industries]**
 - e. **[Montel Inc.]**
 - f. **[Spacefile International Corp.]**
 - g. **[Spacesaver Corporation]**

- h. **[Tennsco]**
- i. **<Insert manufacturer's name>**

B. Bookstack Units <Insert designation>:

1. Type: **[Welded, self-supporting units][Mechanically fastened, self-supporting units][Starter units][Adder units][Sloped display units]<Insert unit type>**.
2. Configuration: **[Double][Single]-faced units[with gusset plates]**.
3. Width: **[36 inches (914 mm)]<Insert dimension>**.
4. Height: **[42 inches (1067 mm)][66 inches (1676 mm)][78 inches (1981 mm)][84 inches (2133 mm)][90 inches (2286 mm)]<Insert dimension>**.
5. Shelf Depth: **[8 inches (203 mm)][9 inches (229 mm)][10 inches (254 mm)][12 inches (305 mm)] nominal**.
6. Base Support: **[Base shelf][Open base with support feet]**.
 - a. Base Shelf Style: **[Flat][Flat with integral backstop]<Insert style>**.
7. Shelves: Provide the following style and number of adjustable shelves:
 - a. Flat **[with integral backstops]**; **[six][five][four][two]<Insert number>** shelves.
 - b. Sloping **[with integral backstops]**; **<Insert number>** shelves.
 - c. Adjustable divider **[with integral backstops]**; **<Insert number>** shelves.
 - d. Fixed periodical; **<Insert number>** shelves.
 - e. Hinged periodical; **<Insert number>** shelves.
 - f. Zigzag paperback shelf; **<Insert number>** shelves.
 - g. Cascade newspaper display; **<Insert number>** shelves.
 - h. Horizontal newspaper display; **<Insert number>** shelves.
 - i. Multimedia, **[single][double]** tier; **<Insert number>** shelves.
 - j. Multimedia browser bin, **[single][double]** tier; **<Insert number>** shelves.
 - k. Hinged flipper door unit; **<Insert number>** shelves.
 - l. Work shelf; **<Insert number>** shelves.
 - m. **<Insert shelf style>**; **<Insert number>** shelves.

C. Wall-Hung Upright Units <Insert designation>:

1. Configuration: **[Two upright starter units][One upright adder unit]**.
2. Width: Space uprights to receive **[36-inch- (914-mm-)]<Insert dimension>** wide shelving.
3. Height: **[42 inches (1067 mm)][66 inches (1676 mm)][78 inches (1981 mm)][84 inches (2133 mm)][90 inches (2286 mm)]<Insert dimension>**.
4. Shelf Depth: **[8 inches (203 mm)][9 inches (229 mm)][10 inches (254 mm)][12 inches (305 mm)] nominal**.
5. Shelves: Provide the following style and number of adjustable shelves:
 - a. Flat **[with integral backstops]**; **[six][five][four][two]<Insert number>** shelves.
 - b. Sloping **[with integral backstops]**; **<Insert number>** shelves.
 - c. Adjustable divider **[with integral backstops]**; **<Insert number>** shelves.
 - d. Fixed periodical; **<Insert number>** shelves.
 - e. Hinged periodical; **<Insert number>** shelves.
 - f. Zigzag paperback shelf; **<Insert number>** shelves.
 - g. Cascade newspaper display; **<Insert number>** shelves.
 - h. Horizontal newspaper display; **<Insert number>** shelves.
 - i. Multimedia, **[single][double]** tier; **<Insert number>** shelves.
 - j. Multimedia browser bin, **[single][double]** tier; **<Insert number>** shelves.
 - k. Hinged flipper door unit; **<Insert number>** shelves.
 - l. Work shelf; **<Insert number>** shelves.

- m. Base shelf with kick plate; 1 shelf.
- n. Picture book; <Insert number> shelves.
- o. <Insert shelf style>; <Insert number> shelves.

D. Frames:

- 1. Uprights: Steel channels, **0.060 inch (1.52 mm)** thick, with slots to receive shelf bracket tabs at **1 inch (25 mm)** o.c.
 - a. Sloped Display Frames: Where indicated, provide upright post frames with additional steel angles, **0.060 inch (1.52 mm)** thick, **36 inches (914 mm)** high, slotted to receive shelving and welded to frame or gusset plates at 10-degree angle to allow better visibility of lower two shelves.
- 2. Spreaders: Tube steel, **0.060 inch (1.52 mm)** thick.
- 3. Longitudinal Bracing: Provide one **[diagonal steel rod with turnbuckles][intermediate spreader]** for each of **[three][four][five]** units in each range of shelving.
- 4. Reinforcing Gusset Plates: Triangular steel plates, **0.060 inch (1.52 mm)** thick, with return flange along bottom edge.

E. Wall-Hung Uprights: Steel channels, **0.060 inch (1.52 mm)** thick, with a minimum of three recessed holes per column for screw attachment to wall surface. Each column will provide double rows of slots to receive shelving tabs at **1 inch (25 mm)** o.c.

F. Adjustable Shelves: **0.048-inch- (1.22-mm-)** thick cold-rolled steel sheet. Provide two brackets per shelf; **0.060-inch- (1.52-mm-)** thick cold-rolled steel.

G. Base Shelves: One-piece shelves, **0.048-inch- (1.22-mm-)** thick cold-rolled steel sheet, designed to receive and fit snugly around uprights, with kick plate **3 inches (76 mm)** high. Provide two brackets per base shelf; **0.060-inch- (1.52-mm-)** thick cold-rolled steel sheet, with return flange along bottom edge. Provide perforated bases at locations where base shelves cover supply-air grilles.

H. Support Feet: Square steel tube, **0.060 inch (1.52 mm)** thick, with black vinyl caps at open ends of tube shape, designed to receive and fit snugly around uprights, extending from both faces of double-faced units or one face of single-faced units.

I. Levelers: Adjustable pin levelers at carpeted surfaces and adjustable glides elsewhere.

J. End Panels: Provide **[one at end of each range][where indicated]**.

- 1. Steel End Panels: Cold-rolled steel sheet, **0.048 inch (1.22 mm)** thick, with **[smooth][patterned]** finish.
- 2. Solid-Wood End Panels: **3/4 to 1 inch (19 to 25 mm)** thick.
- 3. Veneer-Faced End Panels: **3/4 to 1 inch (19 to 25 mm)** thick.
 - a. Style: **[Flat, square top][Flat, arched top][Shadowbox]<Insert style>**.
 - b. Face: **[Wood veneer][High-pressure decorative laminate][Thermoset decorative overlay][Slatwall][Fabric covered]<Insert material>**.

K. Canopy Tops: Provide **[full length of each range][where indicated]** with manufacturer's standard attachment brackets for type of top indicated.

- 1. Steel Top Panels: Cold-rolled steel sheet, **0.048 inch (1.22 mm)** thick, with **[smooth][patterned]** finish.
- 2. Veneer-Faced Top Panels: **3/4 to 1 inch (19 to 25 mm)** thick.

- a. Face: **[Wood veneer][High-pressure decorative laminate][Thermoset decorative overlay]<Insert material>**.

- L. Back Panels: Provide one-piece panels at each single-faced unit; **0.048-inch- (1.22-mm-)** thick cold-rolled steel sheet, with **[smooth][patterned]** finish, sized to completely fill space between uprights.

2.3 WOOD-CASE SHELVING

- A. Wood-Case Library Shelving: Shelving designed for library use, consisting of base frame and full end, top, and back panels, with end panels made to receive pins to support adjustable shelves.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Brodart Co.]**
 - b. **[Buckstaff Company (The)]**
 - c. **[Demco, Inc.]**
 - d. **[Infinite Furniture Solutions (IFS)]**
 - e. **[Liat]**
 - f. **[Maco Manufacturing, Inc.]**
 - g. **[Worden Company]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Brodart Co.]**
 - b. **[Buckstaff Company (The)]**
 - c. **[Demco, Inc.]**
 - d. **[Infinite Furniture Solutions (IFS)]**
 - e. **[Liat]**
 - f. **[Maco Manufacturing, Inc.]**
 - g. **[Worden Company]**
 - h. **<Insert manufacturer's name>**

- B. Bookstack Units **<Insert designation>**:

1. Type: **[Self-supporting][Starter][Adder]** units.
2. Configuration: **[Single][Double]**-faced units.
3. Width: **[36 inches (914 mm)]<Insert dimension>**.
4. Height: **[42 inches (1067 mm)][48 inches (1219 mm)][60 inches (1524 mm)][72 inches (1829 mm)][82 inches (2083 mm)]<Insert dimension>**.
5. Shelf Depth: **[10 inches (254 mm)][12 inches (305 mm)][20 inches (508 mm)][24 inches (610 mm)]** nominal.
6. Shelves: Provide the following style and number of adjustable shelves:
 - a. Flat; **[six][five][four][two]<Insert number>** shelves.
 - b. Adjustable divider; **<Insert number>** shelves.
 - c. Fixed periodical; **<Insert number>** shelves.
 - d. Hinged periodical; **<Insert number>** shelves.
 - e. Cascade newspaper display; **<Insert number>** shelves.

- f. Horizontal newspaper display; <Insert number> shelves.
 - g. Multimedia; <Insert number> shelves.
 - h. Picture book; <Insert number> shelves.
 - i. <Insert shelf style>; <Insert number> shelves.
- C. Base Frames: Solid hardwood toe kick, back rail, and two end cleats, **3 to 4 inches (76 to 102 mm)** high, designed to support bottom shelf and fabricated to attach and tie together vertical panels.
- D. Bottom Shelf: Solid hardwood boards glued together, **3/4 inch (19 mm)** thick, or veneer panels, **1 inch (25 mm)** thick, with **1/4-inch (6.3-mm)** solid-wood banding.
- E. Adjustable Shelves:
 - 1. Adjustable Wood Shelves: Panels consisting of solid hardwood boards glued together, **3/4 inch (19 mm)** thick, or veneer panels, **1 inch (25 mm)** thick, with **1/4-inch (6.3-mm)** solid-wood banding, and grooved on underside to rest securely on supporting pins.
 - 2. Adjustable Steel Shelves: **0.048-inch- (1.22-mm-)** thick cold-rolled steel sheet.
- F. End Panels: Panels consisting of **[solid hardwood boards glued together, 3/4 inch (19 mm) thick,][or][veneer-faced panels, five or nine ply, 1 inch (25 mm) thick, with 1/4-inch (6.3-mm) solid-wood banding]**. Provide two rows of holes at **1-1/4-inch (32-mm)** intervals for **5/16-inch (7.9-mm)** shelf-support pins on one side of end panels and both sides of intermediate panels.
- G. Tops: **3/4- to 1-inch- (19- to 25-mm-)** thick **[veneer-][plastic laminate-]** faced panels banded with **2- to 3-inch (50- to 76-mm)** **[solid hardwood][plastic laminate-faced]** fasciae on one side for single-faced units and on two sides for double-faced units, fabricated to attach and tie together vertical panels **[and for continuous horizontal shelving]**.
- H. Back Panels: Veneer-faced panels, **1/4 inch (6.3 mm)** thick, at each single-faced unit.
- I. Divider Panels: Veneer-faced panels, **1/4 inch (6.3 mm)** thick, at each double-faced unit.

2.4 STEEL-CASE SHELVING

- A. Steel-Case Library Shelving: Shelving designed for library use, consisting of full end, top, and back panels, with end panels made to receive adjustable shelves in slots or to receive clips to support adjustable shelves.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Borroughs Corporation]**
 - b. **[Karp Associates, Inc]**
 - c. **[Montel Inc.]**
 - d. **[Republic Storage Systems, LLC]**
 - e. **[Spacesaver Corporation]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Borroughs Corporation]**

- b. [Karp Associates, Inc]
- c. [Montel Inc.]
- d. [Republic Storage Systems, LLC]
- e. [Spacesaver Corporation]
- f. <Insert manufacturer's name>

B. Bookstack Units <Insert designation>:

- 1. Type: [Self-supporting][Starter][Adder] units.
- 2. Configuration: [Single][Double]-faced units.
- 3. Width: [36 inches (914 mm)]<Insert dimension>.
- 4. Height: [42 inches (1067 mm)][60 inches (1524 mm)][84 inches (2133 mm)][90 inches (2286 mm)]<Insert dimension>.
- 5. Shelf Depth: [9 inches (229 mm)][10 inches (254 mm)][12 inches (305 mm)] nominal.
- 6. Shelves: Provide the following style and number of adjustable shelves:

- a. Flat; [six][five][four][two]<Insert number> shelves.
- b. Adjustable divider; <Insert number> shelves.
- c. Fixed periodical; <Insert number> shelves.
- d. Hinged periodical; <Insert number> shelves.
- e. Multimedia; <Insert number> shelves.
- f. Picture book; <Insert number> shelves.
- g. <Insert shelf style>; <Insert number> shelves.

C. End Panels: Double wall; **0.048-inch- (1.22-mm-)** thick cold-rolled steel sheet, with slots to accept [shelves][shelf-support clips] at [3/4-inch (19-mm)][1-inch (25-mm)] intervals.

D. Base Shelf: One-piece, **0.036-inch- (0.91-mm-)** thick cold-rolled steel sheet, [sloped][flat] with offset formed base.

E. Adjustable Shelves: **0.036-inch- (0.91-mm-)** thick cold-rolled steel sheet.

- 1. Provide manufacturer's standard attachment clips.

F. Steel Back Panels: One- or two-piece panels, **0.024-inch- (0.61-mm-)** thick cold-rolled steel sheet, sized to completely fill space between uprights.

G. Steel Tops: Formed into box shape; **0.036-inch- (0.91-mm-)** thick cold-rolled steel sheet.

H. Veneer-Faced Panels: **3/4- to 1-inch- (19- to 25-mm-)** thick veneer-faced panels at [top][back][and][ends] of units over steel panels at each range, using manufacturer's standard method of connection.

- 1. Face: [Wood veneer][High-pressure decorative laminate][Thermoset decorative overlay]<Insert material>.

2.5 STEEL FOUR-POST SHELVING

A. Steel Four-Post Shelving: Shelving designed for library use, consisting of four angle-iron uprights per section, with adjustable shelves resting on shelf supports hung on uprights.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- a. [Aurora Storage Products, Inc.]
 - b. [Borroughs Corporation]
 - c. [Montel Inc.]
 - d. [Spacefile International Corp.]
 - e. [Spacesaver Corporation]
 - f. [Tennsco]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aurora Storage Products, Inc.]
 - b. [Borroughs Corporation]
 - c. [Montel Inc.]
 - d. [Spacefile International Corp.]
 - e. [Spacesaver Corporation]
 - f. [Tennsco]
 - g. <Insert manufacturer's name>

B. Bookstack Units <Insert designation>:

1. Type: [Self-supporting][Starter][Adder] units.
2. Configuration: [Open][Open with center dividers][Closed back and end] units.
3. Width: [30 inches (762 mm)][36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)]<Insert dimension>.
4. Height: [40 inches (1016 mm)][42 inches (1067 mm)][64 inches (1626 mm)][76 inches (1930 mm)][88 inches (2235 mm)]<Insert dimension>.
5. Shelf Depth: [9 inches (229 mm)][12 inches (305 mm)][18 inches (457 mm)][24 inches (610 mm)] nominal.
6. Shelves: Provide the following style and number of adjustable shelves:
 - a. Flat; [six][five][four][two]<Insert number> shelves.
 - b. Adjustable divider; <Insert number> shelves.
 - c. <Insert shelf style>; <Insert number> shelves.

C. Uprights: Double-wall steel posts, **2 inches (50 mm)** wide, **0.048 inch (1.22 mm)** thick, in manufacturer's standard T-shape for common-post use or L-shape at range ends, with keyhole perforations on the inner wall at **1-1/2 inches (38 mm)** o.c.

D. Closed Back and Ends: **0.024-inch- (0.61-mm-)** thick cold-rolled steel sheet.

E. Steel Spacers: At units with open backs and ends, provide **0.048-inch- (1.22-mm-)** thick steel spacers, **3 inches (76 mm)** high, welded to posts at bottom, center, and top to prevent deflection.

F. Center Divider: **0.024-inch- (0.61-mm-)** thick cold-rolled steel sheets.

G. Base: Support for bottom shelf; **0.060-inch- (1.52-mm-)** thick steel channel; with kick plate **3 to 4 inches (76 to 102 mm)** high and with holes for floor anchors.

H. Adjustable Steel Shelves: **0.030-inch- (0.76-mm-)** thick cold-rolled steel sheet.

1. Shelf Supports: Full-shelf-width supports; **0.075-inch- (1.91-mm-)** thick steel, minimum **3/4 inch (19 mm)** high, with flange to support shelf reinforcements, and with ear at each end containing

2. two shoulder rivets with **7/16-inch (11-mm)** heads spaced to set into keyhole slots on uprights.
2. Shelf Reinforcements: Channel shapes equal in length to depth of the supported shelf; **0.060-inch- (1.52-mm-)** thick steel channels, with notched ends to fit over inside lip of shelf support.

- I. Veneer-Faced Panels: Provide veneer-faced panels at **[top][back][and][ends]** of units over steel panels at each range, using manufacturer's standard method of connection.
 1. Core Material: Particleboard, **3/4 to 1 inch (19 to 25 mm)** thick.
 2. Face: **[Wood veneer][High-pressure decorative laminate][Thermoset decorative overlay]<Insert material>**.

2.6 WOOD MATERIALS

- A. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- B. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- C. Solid Wood: Clear hardwood lumber, selected for compatible grain and color.
 1. Wood Species and Cut: **[Red oak, plain sliced]<Insert species and cut>**.
 2. Staining and Finish: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
- D. Veneer-Faced Panels: HPVA HP-1, with face veneer of species indicated, with Grade A faces.
 1. Face Veneer Species and Cut: **[Red oak, plain sliced]<Insert species and cut>**.
 2. Staining and Finish: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
- E. High-Pressure Decorative Laminate: ISO 4586-3, **[Grade VGS][and][Grade HGL]**.
 1. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
- F. Thermoset Decorative Overlay: Thermally fused, melamine-impregnated decorative paper.
 1. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
- G. End Panel Fabric: Manufacturer's standard fire-resistive fabric covering.
 1. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
- H. Edgebanding: **[Rigid PVC T-molding, through color with satin finish][Minimum 1/8-inch- (3-mm-)]**

thick solid wood of same species as face veneer][Wood veneer of same species as face veneer].

1. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].**

- I. Slatwall: Manufacturer's standard slatwall end panel, consisting of grooved medium-density fiberboard ready to accept slatwall hangers and display units.

1. Colors: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].**

2.7 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish, consisting of prime coat and thermosetting topcoat to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.

1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**

2.9 WOOD FINISHES

- A. Finishing: Apply manufacturer's standard, baked, clear finish, consisting of a sealer and a **[conversion varnish or nitrocellulose lacquer][UV-curing resin]** topcoat. Sand and wipe clean between applications of sealer and topcoat.

2.10 ACCESSORIES

- A. Floor Anchors: Galvanized steel, **[post-installed expansion anchors][power-actuated fasteners][or][threaded concrete screws]**.
- B. Wall Anchors: Manufacturer's standard galvanized-steel anchors.
- C. Top Bracing: Minimum **1- by 1-3/4-inch (25- by 44-mm)** transverse struts, **0.048-inch- (1.22-mm-)** thick steel channels, welded or bolted to top of stack units and securely fastened to structure.
- D. Filler Panels: Provide **[corner][peninsula][and][intermediate wall]** filler panels; **0.048-inch- (1.22-mm-)** thick cold-rolled steel, with fitted caps, in color and finish to match shelving. Locate where indicated to fill gaps at abutting shelving units.
- E. Findable Book Supports: Unattached book support, **[6 inches (152 mm)][9 inches (229 mm)]** high, with cork pad on bottom, for use on shelf surface.
 1. Provide **[two]<Insert quantity>** per shelf.
- F. Sliding Book Supports: Movable, **3/16-inch- (4.8-mm-)** diameter wire supports **[attached to plastic**

slider blocks], designed for insertion into track on **[backstop][shelf]**.

1. Provide **[two]<Insert quantity>** per shelf.
- G. Adjustable Shelf Dividers: One-piece, **[steel][wood]** shelf partitions, with hooks or tabs to fit in slots in divider shelves.
 1. Provide **[five]<Insert quantity>** per shelf.
- H. Sliding Reference Shelves: High-pressure laminate over particleboard core, **3/4 to 1 inch (19 to 25 mm)** thick, mounted on sliding extension hardware to allow shelves to retract for storage when not in use.
 1. Provide **[one]<Insert number>** per range.
- I. Center Backstops: Adjustable steel shelf backstops, **0.048 inch (1.22 mm)** thick, with stiffening flanges and hooks for attachment to uprights.
 1. Provide one per shelf.
- J. Shelf Label Holders: Clear plastic, **5 inches (127 mm)** long, designed to snap over adjustable shelves.
 1. Provide one per shelf.
- K. Adhesive Shelf Label: Blank labels, **3/4 inch (19 mm)** high, backed with pressure-sensitive adhesive for direct attachment to shelf.
 1. Provide one per shelf.
- L. Range Finders: Units attached to and extending from range end in V-shape, sized to hold **3-by-5-inch (76-by-127-mm)** cards.
 1. Provide one for each end of each range.
- M. Cardholders: Sized to hold **3-by-5-inch (76-by-127-mm)** cards.
 1. Provide one for single-faced units and two for double-faced units at each end of each range.
- N. Furniture Casters: Nonmarking; **[hooded][nonhooded]**; **[single-wheel][twin-wheel][spherical-ball]** type; **[nylon][urethane][thermoplastic rubber][polyolefin]** tread; **[and][top plate][stem][hidden corner bracket]** attachment **[and integral brakes]**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor[**and wet mop resilient flooring**] over which shelving is to be installed.
- B. Before installing [**wood-case shelving**][**veneer-faced panels**], condition materials to average prevailing humidity in installation areas for a minimum of 48 hours[**unless longer conditioning is recommended by manufacturer**].

3.3 INSTALLATION OF LIBRARY STACK SYSTEMS

- A. Install library stack systems at locations indicated on Drawings and according to manufacturer's written instructions.
- B. Starter/Adder Units: Connect groups together with standard fasteners according to manufacturer's written instructions, using concealed fasteners where possible.
- C. Enclosure Panels: Install [**end panels**][**and**][**canopy tops**] with concealed fasteners.
- D. Level and plumb bookstack units to a tolerance of **1/8 inch in 96 inches (3 mm in 2438 mm)**.
- E. Filler Panels: Install [**corner**][**peninsula**][**and**][**intermediate wall**] filler panels where indicated to fill gaps at abutting shelving units.
- F. Install type of shelves at locations indicated and at spacing indicated or, if not indicated, at equal spacing in each unit.

3.4 ANCHORAGE

- A. Bookstack Anchorage: Install bookstacks using floor anchors, wall anchors, or top bracing in locations recommended by manufacturer and as indicated on Shop Drawings.

3.5 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protect installed products from damage during remainder of the construction period.

END OF SECTION 11 51 00 00



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Task	Specification	Specification Description
11 51 19 00	11 51 00 00	Library Stack Systems



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SECTION 11 52 13 00 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, front-projection screens.
2. Electrically operated, front-projection screens.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal support framing for front-projection screens.
2. Section 061000 "Rough Carpentry" for wood backing for screen installation.
3. Section 064023 "Interior Architectural Woodwork" for **[wood trim][wood trim and wood ceiling closure panel]** for recessed screen installation.
4. Section 115213.19 "Rear Projection Screens."

1.2 DEFINITIONS

- A. ALR: Ambient-light rejection; for specular reflective viewing surfaces, measured as the percentage of ambient light striking the viewing surface that has equal angles of incidence and reflection.
- B. Gain: Ratio of light reflected from viewing-surface material to that reflected perpendicularly from a magnesium carbonate surface as determined in accordance with SMPTE RP 94.
- C. Half-Gain Angle: The angle, measured from the axis of the viewing surface to the most central position on a perpendicular plane through the horizontal centerline of the viewing surface, where the gain is half of the peak gain.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:

1. Drop heights.
2. Location of seams in viewing surfaces.
3. For end-mounted motors, location of screen centerline relative to ends of screen case.
4. Anchorage details, including connection to supporting structure for suspended units.
5. Details of juncture of screen case or trim with adjacent finishes.
6. For electrically operated units, wiring diagrams and location of wiring connections.
7. Accessories.

C. Samples: For each type of exposed finish and for each color and finish specified, in manufacturer's standard sizes.

D. Samples for Initial Selection: For each type of exposed finish.

- E. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.
- F. Product Schedule: For front-projection screens.[**Use same designations indicated on Drawings.**]

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver front-projection screens until spaces are enclosed and weathertight, wet-work in installation spaces is complete and dry, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions planned for building occupants during the remainder of the construction period.
- B. Store front-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.6 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC system components,[**fire-suppression system,**] and partitions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Projection Screens: Obtain [**front-projection screens**][**each type of front-projection screen**] from single manufacturer. Obtain viewing surfaces and accessories, including mounting hardware, from screen manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Viewing-Surface and Masking Materials:
 - 1. Mildew-Resistance Rating: Zero or 1 when tested in accordance with ASTM G21.
 - 2. Flame Resistance: Passes NFPA 701.
 - 3. Flame-Spread Index: Not greater than 75 when tested in accordance with ASTM E84.

2.3 MANUALLY OPERATED, FRONT-PROJECTION SCREENS

- A. General Requirements: Manufacturer's standard spring-roller-operated units, consisting of case, flexible screen, mounting accessories, and other components necessary for a complete installation.
 - 1. Screen Mounting: Top edge securely anchored to a rigid steel roller; bottom edge formed into a pocket holding a tubular metal slat, with ends of slat protected by plastic caps, and with a saddle

and pull attached to slat by screws.

- B. Metal-Encased, Manually Operated Screen : Unit with free-hanging screen; with screen case fabricated from formed-steel sheet or aluminum extrusions with manufacturer's standard finish and matching end caps.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Alltec Screens; a brand of Alltec Pro]**
 - b. **[Draper, Inc.]**
 - c. **[Legrand AV Inc.; Legrand North America, LLC]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Alltec Screens; a brand of Alltec Pro]**
 - b. **[Draper, Inc.]**
 - c. **[Legrand AV Inc.; Legrand North America, LLC]**
 - d. **<Insert manufacturer's name>**
 3. Surface-Mounting Configuration: **[Mounted using manufacturer's standard projecting wall brackets][Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting][Recessed in ceiling trough indicated on Drawings, with concealed mounting]<Insert requirements>**.
 4. Screen Case Color: **[As selected by Architect from manufacturer's standard options][White][Black]<Insert requirements>**.
 5. Matte Viewing Surface: **[White, 1.0 minimum peak gain and 60-degree minimum half-gain angle][White, 1.0 minimum peak gain and material does not reach half gain][Gray, 0.8 minimum peak gain and material does not reach half gain]<Insert requirements>**.
 6. Viewing Surface: **<Insert requirements>**.
 7. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top][bottom][location indicated on Drawings]<Insert requirements>** of viewing surface.
 8. Edge Treatment: **[Black][Without black]** masking borders.
 9. Size of Viewing Surface: **[As indicated in schedule on Drawings][40 by 64 inches (1016 by 1626 mm)][50 by 80 inches (1270 by 2032 mm)][40-1/2 by 72 inches (1029 by 1829 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)]<Insert dimensions>**.
 10. Extra Drop Height: **[As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert requirements>**.
 - a. Color: **[Same as viewing surface][Black]**.
- C. Wood-Finished, Manually Operated Screen : Unit with free-hanging screen; with screen case with flat back, hardwood finish, and concealed mounting brackets for surface mounting on wall or ceiling, as indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. <Insert manufacturer's name>
3. Screen Case Hardwood: [Oak][Walnut][Mahogany][Cherry][As selected by Architect from manufacturer's full range of species]<Insert species>.
 - a. Corners: [Radiused][Rectilinear][Traditional crown trim at top, rectilinear at sides and bottom][Beveled at top, eased at sides and bottom]<Insert requirements>.
 - b. Finish: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirements>.
4. Matte Viewing Surface: [White, 1.0][Gray, 0.8]<Insert requirements> minimum peak gain; material does not reach half-gain.
5. Viewing Surface: <Insert requirements>.
6. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [top][bottom][location indicated on Drawings]<Insert requirements> of viewing surface.
7. Edge Treatment: [Black][Without black] masking borders.
8. Size of Viewing Surface: [As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)]<Insert dimensions>.
9. Extra Drop Height: [As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert requirements>.
 - a. Color: [Same as viewing surface][Black].

2.4 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

- A. General Requirements: Manufacturer's standard units, consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. [Provide units that are listed and labeled as an assembly by Underwriters Laboratories Inc. (UL) or another testing and inspecting agency acceptable to authorities having jurisdiction.]
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a metal rod, with ends of rod protected by plastic caps.
- B. Surface-Mounted, Metal-Encased, Electrically Operated Screen : Motor-in-roller unit with screen case fabricated from formed-steel sheet or from aluminum extrusions with manufacturer's standard finish and matching end caps.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Alltec Screens; a brand of Alltec Pro]
 - b. [Draper, Inc.]
 - c. [Legrand AV Inc.; Legrand North America, LLC]
 - d. [Screen Innovations]
 - e. [Stewart Filmscreen]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Alltec Screens; a brand of Alltec Pro]
 - b. [Draper, Inc.]
 - c. [Legrand AV Inc.; Legrand North America, LLC]
 - d. [Screen Innovations]
 - e. [Stewart Filmscreen]
 - f. <Insert manufacturer's name>
3. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
4. Controls: Remote,[**key-operated**,] three-position control switch installed in recessed device box with flush cover plate[**matching other electrical device cover plates in room where switch is installed**].
 - a. Provide with [one control switch][two control switches][number of control switches indicated on Drawings]<Insert requirements>.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide key-operated, power-supply switch.
 - e. Provide [infrared][radio-frequency] remote control, consisting of battery-powered transmitter and receiver.
 - f. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
5. Surface-Mounting Configuration: [Mounted using manufacturer's standard projecting wall brackets][Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting][Recessed in ceiling trough indicated on Drawings, with concealed mounting]<Insert requirements>.
6. Screen-Case Color: [As selected by Architect from manufacturer's standard options][White][Black]<Insert requirements>.
7. Free-Hanging, Matte Viewing Surface: [White, 1.0 minimum peak gain and 60-degree minimum half-gain angle][White, 1.0 minimum peak gain and material does not reach half gain][Gray, 0.8 minimum peak gain and material does not reach half gain]<Insert requirements>.
 - a. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [top][bottom][location indicated on Drawings]<Insert requirements> of viewing surface.
 - b. Edge Treatment: [Manufacturer's standard][Black][Without black] masking borders.
8. Tab-Tensioned, High-Contrast-Gray Viewing Surface: Minimum peak gain of [0.6 and 60-degree][0.8 and 45-degree]<Insert requirements> minimum half-gain angle[, with black backing].



- a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 - b. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top][bottom][location indicated on Drawings]<Insert requirements>** of viewing surface.
 9. Tab-Tensioned, Gain-White Viewing Surface: Minimum peak gain of **[1.3 and 75-degree][1.5 and 60-degree][1.7 and 40-degree]<Insert requirements>** minimum half-gain angle. Provide viewing surface with black backing and without seams.
 - a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 10. Tab-Tensioned, ALR Viewing Surface: Minimum peak gain of **[0.8, 57 percent ALR, and 50-degree][1.0, 73 percent ALR, and 35-degree][1.0, 82 percent ALR, and 18-degree]<Insert requirements>** minimum half-gain angle. Provide viewing surface without seams.
 - a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 11. Size of Viewing Surface: **[As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][87-1/2 by 140 inches (2223 by 3556 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)][79 by 140 inches (2007 by 3556 mm)]<Insert dimensions>**.
 12. Extra Drop Height: **[As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert description>**.
 - a. Color: **[Same as viewing surface][Black]**.
- C. Surface-Mounted, Wood-Finished, Electrically Operated Screen : Motor-in-roller unit with tab-tensioned screen; with screen case with flat back, hardwood finish, and concealed mounting brackets for surface mounting on wall or ceiling, as indicated on Drawings.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **<Insert manufacturer's name>**
 3. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

4. Controls: Remote, [**key-operated,**] three-position control switch installed in recessed device box with flush cover plate [**matching other electrical device cover plates in room where switch is installed**].
 - a. Provide with [**one control switch**] [**two control switches**] [**number of control switches indicated on Drawings**] <Insert requirements>.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide key-operated, power-supply switch.
 - e. Provide [**infrared**] [**radio-frequency**] remote control, consisting of battery-powered transmitter and receiver.
 - f. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
 5. Screen-Case Hardwood: [**Oak**] [**Walnut**] [**Mahogany**] [**Cherry**] [**As selected by Architect from manufacturer's full range of species**] <Insert species>.
 - a. Corners: [**Radiused**] [**Rectilinear**] [**Traditional crown trim at top, rectilinear at sides and bottom**] [**Beveled at top, eased at sides and bottom**] <Insert requirements>.
 - b. Finish: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert requirements>.
 6. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 7. Matte-White Viewing Surface: [**1.0 minimum peak gain; material does not reach half-gain**] <Insert requirements>. Provide viewing surface [**with**] [**without**] black backing.
 - a. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [**top**] [**bottom**] [**location indicated on Drawings**] <Insert requirements> of viewing surface.
 8. High-Contrast-Gray Viewing Surface: [**0.6 minimum peak gain; material does not reach half gain**] <Insert requirements>. Provide viewing surface [**with**] [**without**] black backing.
 - a. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [**top**] [**bottom**] [**location indicated on Drawings**] <Insert requirements> of viewing surface.
 9. Gain-White Viewing Surface: Minimum peak gain of [**1.3**] [**1.6**] [**1.8**] <Insert value>; material does not reach half gain. Provide viewing surface without seams and with black backing.
 10. ALR Viewing Surface: Minimum peak gain of [**0.8, 57 percent ALR, and 50-degree**] [**0.1, 73 percent ALR, and 35-degree**] [**0.1, 82 percent ALR, and 18-degree**] <Insert requirements> minimum half-gain angle. Provide viewing surface without seams.
 11. Size of Viewing Surface: [**As indicated in schedule on Drawings**] [**50 by 80 inches (1270 by 2032 mm)**] [**57-1/2 by 92 inches (1461 by 2337 mm)**] [**45 by 80 inches (1143 by 2032 mm)**] [**52 by 92 inches (1321 by 2337 mm)**] <Insert dimensions>.
 12. Extra Drop Height: [**As indicated in schedule on Drawings**] [**As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor**] [**36 inches (900 mm) at bottom of screen**] <Insert requirements>.
 - a. Color: [**Same as viewing surface**] [**Black**].
- D. Suspended, Electrically Operated Screen : Unit designed and fabricated for suspended mounting.
1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Draper, Inc.]
 - b. [Legrand AV Inc.; Legrand North America, LLC]
 - c. [Stewart Filmscreen]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Draper, Inc.]
 - b. [Legrand AV Inc.; Legrand North America, LLC]
 - c. [Stewart Filmscreen]
 - d. <Insert manufacturer's name>
3. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
4. End-Mounted Motor: Instant-reversing, gear-drive motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Locate motor in its own compartment **[on right end of screen][on left end of screen][on end of screen indicated on Drawings]**. Support roller with self-aligning bearings in brackets.
5. Wiring Compartment: Metal or metal lined.
6. Controls: Remote, **[key-operated,]** three-position control switch installed in recessed device box with flush cover plate **[matching other electrical device cover plates in room where switch is installed]**.
 - a. Provide with **[one control switch][two control switches][number of control switches indicated on Drawings]<Insert requirements>**.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide key-operated, power-supply switch.
 - e. Provide **[infrared][radio-frequency]** remote control, consisting of battery-powered transmitter and receiver.
 - f. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
7. Screen Case: **[Metal][Metal and fire-retardant materials][Metal, wood, wood products, and fire-retardant materials]**.
 - a. Ceiling Aperture: **[Open under screen compartment][With closure, hinged to automatically open when screen is lowered and automatically close when screen is fully raised]**.
 - 1) Provide screen case **[with trim flange to receive ceiling finish][constructed to be installed with underside flush with ceiling][constructed to be installed with ceiling finish applied to underside]**.
 - b. Finish on Exposed Surfaces: **[Manufacturer's standard][Prime painted][Vinyl covering**

or baked enamel]<Insert requirements>.

8. Free-Hanging, Matte Viewing Surface: [White, 1.0 minimum peak gain and 60-degree minimum half-gain angle][White, 1.0 minimum peak gain and material does not reach half gain][Gray, 0.8 minimum peak gain and material does not reach half gain]<Insert requirements>.
 - a. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [top][bottom][location indicated on Drawings]<Insert requirements> of viewing surface.
 - b. Edge Treatment: [Manufacturer's standard][Black][Without black] masking borders.
9. Tab-Tensioned, High-Contrast-Gray Viewing Surface: Minimum peak gain of [0.6 and 60-degree][0.8 and 45-degree]<Insert requirements> minimum half-gain angle[, with black backing].
 - a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 - b. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [top][bottom][location indicated on Drawings]<Insert requirements> of viewing surface.
10. Tab-Tensioned, Gain-White Viewing Surface: Minimum peak gain of [1.3 and 75-degree][1.5 and 60-degree][1.7 and 40-degree]<Insert requirements> minimum half-gain angle. Provide viewing surface with black backing and without seams.
 - a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
11. Tab-Tensioned, ALR Viewing Surface: Minimum peak gain of [0.8, 57 percent ALR, and 50-degree][1.0, 73 percent ALR, and 35-degree][1.0, 82 percent ALR, and 18-degree]<Insert requirements> minimum half-gain angle. Provide viewing surface without seams.
 - a. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
12. Size of Viewing Surface: [As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][87-1/2 by 140 inches (2223 by 3556 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)][79 by 140 inches (2007 by 3556 mm)]<Insert dimensions>.
13. Extra Drop Height: [As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert description>.
 - a. Color: [Same as viewing surface][Black].

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install front-projection screens at locations indicated on Drawings to comply with screen manufacturer's

written instructions.

- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor them to supporting substrate in a manner that produces a smoothly operating screen that, when lowered, has flat viewing surface and plumb vertical edges.
 - 1. Install low-voltage controls in accordance with NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway, except in accessible ceiling spaces and in gypsum board partitions, where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables, except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
 - 3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION 11 52 13 00

SECTION 11 52 13 00A - REAR PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rigid rear-projection screens.
2. Electrically operated, flexible rear-projection screens.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal support framing for rear-projection screens.
2. Section 061000 "Rough Carpentry" for wood backing for screen installation.
3. Section 064023 "Interior Architectural Woodwork" for **[wood trim][wood trim and wood ceiling closure panel][wood frames]** for recessed screen installation.
4. **[Section 081113 "Hollow Metal Doors and Frames"]****[Section 081116.13 "Interior Aluminum Doors and Frames"]** for metal frames for field-installed, rear-projection screens.

1.2 DEFINITIONS

- A. Gain: Ratio of light refracted from viewing-surface material to that reflected perpendicularly from a magnesium carbonate surface as determined in accordance with SMPTE RP 94, except that, for measuring luminance of test viewing-surface material, projection lamp to be placed behind viewing surface at same distance as it was placed in front of magnesium carbonate surface for measuring luminance of reference standard.
- B. Half-Gain Angle: The angle, measured from the axis of the viewing surface to the most central position on a perpendicular plane through the horizontal centerline of the viewing surface, where the gain is half of the peak gain.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show layouts and types of rear-projection screens. Include the following:

1. For rigid rear-projection screens:
 - a. Frame details.
 - b. Anchorage details.
 - c. Details of juncture of exposed projection-screen surfaces with adjacent finishes.
 - d. Accessories.
2. For electrically operated, flexible rear-projection screens:
 - a. Drop heights.
 - b. Anchorage details, including connection to supporting structure for suspended units.
 - c. Details of juncture of screen case or trim with adjacent finishes.

- d. Location of wiring connections.
- e. Wiring diagrams.
- f. Accessories.

- C. Samples: For each type of exposed finish and for each color and finish specified, in manufacturer's standard sizes.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.
- F. Product Schedule: For rear-projection screens. **[Use same designations indicated on Drawings.]**

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For rear-projection screens to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver rear-projection screens until spaces are enclosed and weathertight, wet-work in installation spaces is complete and dry, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions planned for building occupants during the remainder of the construction period.
- B. Store rear-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.6 COORDINATION

- A. Coordinate layout and installation of rear-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC system components, **[fire-suppression system,]** and partitions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Rear-Projection Screens: Obtain **[rear-projection screens][each type of rear-projection screen]** from single manufacturer. Obtain viewing surfaces and accessories, including mounting hardware, from screen manufacturer.
 - 1. Obtain rear-projection screens from same manufacturer as front-projection screens.

2.2 RIGID REAR-PROJECTION SCREENS

- A. Rigid Rear-Projection Screen : Transparent substrate with permanently bonded optical coating; provide with gaskets, setting blocks, fasteners, and other components necessary for complete installation.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**

 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**

 3. Optical Coating: Minimum peak gain of **[0.5 and 43-degree][0.70 and 48-degree][0.70 and 180-degree][0.75 and 78-degree][0.90 and 71-degree][1.0 and 35-degree][1.0 and 50-degree][1.0 and 63-degree][1.3 and 33-degree][1.5 and 31-degree]<Insert values>** minimum half-gain angle applied to transparent substrate indicated below.
 - a. Acrylic Substrate: Colorless, transparent, cast-acrylic sheet with a luminous transmittance of 92 percent in accordance with ASTM D1003 and complying with ASTM D4802, Category A-1 (cell cast), Finish 1 (smooth or polished), **[1/4 inch (6.4 mm)][3/8 inch (9.5 mm)][1/2 inch (12.7 mm)]<Insert dimension>** thick.
 - b. Semi-Rigid Acrylic Substrate: Colorless, transparent acrylic sheet that can be rolled for shipping; minimum **[1/8 inch (3 mm)][3/16 inch (5 mm)]<Insert dimension>** thick.
 - c. Glass Substrate: Clear float glass complying with ASTM C1036 for Type I (transparent glass, flat), Class 1 (clear), and Quality q3 (glazing select), **[6.0 mm][10.0 mm][12.0 mm]<Insert dimension>** thick.
 - d. Optical Tint: **[High-contrast dark gray][Medium neutral gray][Neutral white][Manufacturer's standard]<Insert requirements>**.

 4. Size of Viewing Surface: **[As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][87-1/2 by 140 inches (2223 by 3556 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)][79 by 140 inches (2007 by 3556 mm)]<Insert dimensions>**, one piece.
- B. Factory Frames:** Screen manufacturer's standard frames **[of profile indicated on Drawings]<Insert description>**, fabricated to sizes required to fit screens from aluminum extrusions complying with **ASTM B221 (ASTM B221M)** for 6063-T5 alloy and temper.
1. Class II, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
 2. Class II, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
 - a. Color: **[Black][Dark bronze][Either black or dark bronze, as standard with manufacturer]<Insert color>**.

2.3 ELECTRICALLY OPERATED, FLEXIBLE REAR-PROJECTION SCREENS

- A. General Requirements: Manufacturer's standard units, consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. **[Provide units that are listed and labeled as an assembly by Underwriters Laboratories Inc. (UL) or another testing and inspecting agency acceptable to authorities having jurisdiction.]**
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a metal rod, with ends of rod protected by plastic caps.
 3. Viewing-Surface and Masking Materials:
 - a. Mildew-Resistance Rating: Zero or 1 when tested in accordance with ASTM G21.
 - b. Flame Resistance: Passes NFPA 701.
 - c. Flame-Spread Index: Not greater than 75 when tested in accordance with ASTM E84.
 - d. Seamless Construction: Provide viewing surfaces, in sizes indicated, without seams.
- B. Surface-Mounted, Metal-Encased, Electrically Operated Screen : Motor-in-roller unit with tab-tensioned screen and screen case fabricated from formed-steel sheet or from aluminum extrusions with manufacturer's standard finish and matching end caps.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**
 3. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 4. Controls: Remote, **[key-operated,]** three-position control switch installed in recessed device box with flush cover plate **[matching other electrical device cover plates in room where switch is installed].**
 - a. Provide with **[one control switch][two control switches][number of control switches indicated on Drawings]<Insert requirements>**.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide key-operated, power-supply switch.

- e. Provide **[infrared][radio-frequency]** remote control, consisting of battery-powered transmitter and receiver.
 - f. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
5. Surface-Mounting Configuration: **[Mounted using manufacturer's standard projecting wall brackets][Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting][Recessed in ceiling trough indicated on Drawings with concealed mounting]<Insert requirements>**.
 6. Screen-Case Color: **[As selected by Architect from manufacturer's standard options][White][Black]<Insert requirements>**.
 7. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 8. Off-White Viewing Surface: Minimum peak gain of **[0.65 and 78-degree][0.9 and 65-degree][1.0 and 63-degree][1.3 and 42-degree]<Insert requirements>** minimum half-gain angle.
 9. Gray Viewing Surface: Minimum peak gain of **[1.0 and 39-degree][1.2 and 30-degree][1.5 and 31-degree]<Insert requirements>** minimum half-gain angle.
 10. Size of Viewing Surface: **[As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][87-1/2 by 140 inches (2223 by 3556 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)][79 by 140 inches (2007 by 3556 mm)]<Insert dimensions>**.
 11. Extra Drop Height: **[As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert requirements>**.
 - a. Color: **[Same as viewing surface][Black]**.
- C. Suspended, Electrically Operated Screen : Motor-in-roller unit designed and fabricated for suspended mounting with tab-tensioned screen.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Draper, Inc.]**
 - b. **[Legrand AV Inc.; Legrand North America, LLC]**
 - c. **[Stewart Filmscreen]**
 - d. **<Insert manufacturer's name>**
 3. Wiring Compartment: Metal or metal lined.
 4. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 5. Controls: Remote, **[key-operated,]** three-position control switch installed in recessed device box



with flush cover plate[**matching other electrical device cover plates in room where switch is installed**].

- a. Provide with [one control switch][two control switches][number of control switches indicated on Drawings]<Insert requirements>.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide locking cover plates for switches.
 - d. Provide key-operated, power-supply switch.
 - e. Provide [infrared][radio-frequency] remote control, consisting of battery-powered transmitter and receiver.
 - f. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
6. Screen Case: Made from [metal][metal and fire-retardant materials].
- a. Ceiling Aperture: [Open under screen compartment][With closure, hinged to automatically open when screen is lowered and automatically close when screen is fully raised].
 - 1) Provide screen case [with trim flange to receive ceiling finish][constructed to be installed with underside flush with ceiling][constructed to be installed with ceiling finish applied to underside].
 - b. Finish on Exposed Surfaces: [Manufacturer's standard][Prime painted][Vinyl covering or baked enamel]<Insert requirements>.
7. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
8. Off-White Viewing Surface: Minimum peak gain of [0.65 and 78-degree][0.9 and 65-degree][1.0 and 63-degree][1.3 and 42-degree]<Insert requirements> minimum half-gain angle.
9. Gray Viewing Surface: Minimum peak gain of [1.0 and 39-degree][1.2 and 30-degree][1.5 and 31-degree]<Insert requirements> minimum half-gain angle.
10. Size of Viewing Surface: [As indicated in schedule on Drawings][50 by 80 inches (1270 by 2032 mm)][57-1/2 by 92 inches (1461 by 2337 mm)][87-1/2 by 140 inches (2223 by 3556 mm)][45 by 80 inches (1143 by 2032 mm)][52 by 92 inches (1321 by 2337 mm)][79 by 140 inches (2007 by 3556 mm)]<Insert dimensions>.
11. Extra Drop Height: [As indicated in schedule on Drawings][As needed at top of screen for bottom of screen to be 36 inches (900 mm) above floor][36 inches (900 mm) at bottom of screen]<Insert description>.
- a. Color: [Same as viewing surface][Black].

PART 3 - EXECUTION

3.1 INSTALLATION OF RIGID REAR-PROJECTION SCREENS

- A. Install rear-projection screens to comply with screen manufacturer's written instructions. Install screens using procedures and tools recommended in writing by screen manufacturer; do not abrade viewing surfaces and damage finishes.
- B. Install rigid rear-projection screens with optical coating toward [projector][audience].
- C. Install factory-framed, rear-projection screens in prepared wall openings. Securely anchor frames to

surrounding construction, so frames are level and plumb and screen surfaces are flat.

- D. Install viewing surfaces in frames specified in other Sections, to comply with screen manufacturer's written instructions. Set with viewing surfaces flat and with edges level and plumb.

3.2 INSTALLATION OF ELECTRICALLY OPERATED, FLEXIBLE REAR-PROJECTION SCREENS

- A. Install rear-projection screens to comply with screen manufacturer's written instructions, and securely anchor them to supporting substrate in a manner that produces a smoothly operating screen that, when lowered, has flat viewing surface and plumb vertical edges.
 - 1. Install low-voltage controls in accordance with NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway, except in accessible ceiling spaces and in gypsum board partitions, where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables, except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

3.3 PROTECTING AND CLEANING RIGID REAR-PROJECTION SCREENS

- A. Provide temporary covering of rear-projection screens until time of Substantial Completion. Use type of covering approved in writing by screen manufacturer that effectively protects screen from abrasion, breakage, or other damage.
- B. Clean rear-projection screens on both faces immediately before date scheduled for inspection intended to establish date of Substantial Completion. Use methods and cleaning materials recommended in writing by screen manufacturer; do not scratch or damage optical coatings or viewing-surface substrates.

END OF SECTION 11 52 13 00A

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Task	Specification	Specification Description
11 52 13 13	01 11 19 00	No Specification Required
11 52 13 13	11 52 13 00	Projection Screens
11 52 13 13	11 52 13 00a	Rear Projection Screens
11 52 13 16	11 52 13 00	Projection Screens
11 52 13 16	11 52 13 00a	Rear Projection Screens
11 52 16 26	01 11 19 00	No Specification Required



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SECTION 11 53 13 00 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Constant volume fume hoods.
2. Bypass fume hoods.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring fume hoods.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to fume hood base cabinets.
4. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of fume hoods.
5. Section 230923 "Direct Digital Control (DDC) System for HVAC" for VAV controls for fume hood exhaust.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.
- B. Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For laboratory fume hoods.
1. Include plans, elevations, sections, and attachment details.
 2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports. **[Include calculations demonstrating that anchorages comply with seismic performance requirements.]**
 3. Indicate locations and types of service fittings together with associated service supply connection required.
 4. Indicate duct connections, electrical connections, and locations of access panels.
 5. Include roughing-in information for mechanical, plumbing, and electrical connections.
 6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from the above items.

7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
8. Include coordinated dimensions for laboratory equipment specified in other Sections.

- C. Samples: For **[fume hood exterior finishes][interior lining][epoxy sinks][epoxy work tops][and][phenolic-composite work tops]**.
- D. Delegated Design Submittals: For fume hoods indicated to comply with seismic performance requirements and design criteria.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Showing compliance with specified performance requirements for as-manufactured containment and static pressure loss, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 SOURCE QUALITY CONTROL

- A. Demonstrate fume hood performance before shipment by testing **[one fume hood for each type required][fume hoods]** according to ASHRAE 110 **[as modified in "Performance Requirements" Article]**. Provide testing facility, instruments, equipment, and materials needed for tests.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain laboratory fume hoods from single manufacturer.
- B. Obtain laboratory fume hoods from same source[**from same manufacturer**] as laboratory casework.
- C. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' fume hoods of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110[**as modified below**]:
 - 1. As-Manufactured (AM) Rating: [AM 0.05 (0.05 ppm)][AM 0.02 (0.02 ppm)][AM 0.01 (0.01 ppm)][As indicated in the Fume Hood Schedule]<Insert rating>.
 - 2. As-Installed (AI) Rating: [AI 0.10 (0.10 ppm)][AI 0.05 (0.05 ppm)][As indicated in the Fume Hood Schedule]<Insert rating>.
 - 3. Average Face Velocity: [100 fpm (0.51 m/s)]<Insert value> plus or minus 10 percent with sashes fully open.
 - 4. Face-Velocity Variation: Not more than [10][15][20]<Insert number> percent of average face velocity across the face opening with sashes fully open.
 - 5. Sash Position: Fully open.
 - a. Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 - b. Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 - 6. Release Rate: [4.0 L/min.][6.0 L/min.]
 - 7. Test Setup Modifications: Conduct tests with a minimum of three and a maximum of five people in the test room and with two 1-gal. (3.8-L) round paint cans, one 12-by-12-by-12-inch (300-by-300-by-300-mm) cardboard box, and three 6-by-6-by-12-inch (150-by-150-by-300-mm) cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches (150 to 250 mm) behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch (50-by-50-mm) blocks.
 - 8. Walk-by Test: At the conclusion of containment test, execute three rapid walk-bys at 30-second intervals, 12 inches (300 mm) behind the mannequin. Test-gas concentration during each walk-by to not exceed 0.1 ppm and to return to specified containment value within 15 seconds.
- B. Static-Pressure Loss: Not more than [1/2-inch wg (124 Pa)]<Insert value> at [100-fpm (0.51-m/s)]<Insert value> face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design fume hoods for seismic performance.
- D. Seismic Performance: Fume hoods[, **including attachments to other work,**] to withstand the effects of

earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is <Insert value>.
2. Component Importance Factor: 1.5.

2.3 FUME HOODS, GENERAL

- A. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." [Provide fume hoods UL listed and labeled for compliance with UL 1805.]
- B. Constant Volume Fume Hoods: Provide constant volume fume hoods without bypass [where indicated].
- C. Bypass Fume Hoods: Provide bypass fume hoods [where indicated]. Compensating bypass above the sash opens as sash is closed. Provide sufficient bypass capacity so that face velocity with sash opening of 6 inches (150 mm) does not exceed 3 times the face velocity with sash fully open.
- D. Restricted-Bypass Fume Hoods: Provide restricted-bypass fume hoods [where indicated]. Partial compensating bypass above the sash opens after sash is closed to less than [20][40] percent open. Design partial bypass to maintain exhaust capacity of at least 25 cfm per sq. ft. (127 L/s per sq. m) of work surface regardless of sash position.
- E. VAV Control: [Where indicated, equip][Equip] fume hoods with an electronic control unit with a sensing device that monitors face velocity, and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit. Equip units with manual override switch that opens motorized damper to provide maximum exhaust capacity regardless of sash position.
 1. Provide output transmitter on electronic control unit that produces zero- to 10-V dc signal proportional to fume hood exhaust volume for interface with building's HVAC control system.
 2. Provide electronic control unit that also monitors sash position and anticipates changes in face velocity caused by abrupt changes in sash position.
- F. Auxiliary Air: [Where indicated, equip][Equip] fume hoods with auxiliary-air outlet for connection to a system that supplies air from an external source equal to 70 percent of the exhausted air volume. Auxiliary-air system introduces air directly above and immediately in front of hood face. Capture efficiency of hoods to be 90 percent minimum.

2.4 CONSTANT VOLUME FUME HOODS

- A. Description: Constant volume fume hoods are sometimes called "conventional fume hoods." If VAV control is not used, face velocity increases as sash is closed.
- B. Constant Volume Fume Hoods with Steel Exterior:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Air Master Systems, Corp.]

- b. [Bedcolab]
 - c. [BMC, Inc.]
 - d. [Genie Scientific, Inc.]
 - e. [Hanson Lab Solutions]
 - f. [Lab Crafters, Inc.]
 - g. [Labcono]
 - h. [Mott Manufacturing Ltd]
 - i. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Air Master Systems, Corp.]
 - b. [Bedcolab]
 - c. [BMC, Inc.]
 - d. [Genie Scientific, Inc.]
 - e. [Hanson Lab Solutions]
 - f. [Lab Crafters, Inc.]
 - g. [Labcono]
 - h. [Mott Manufacturing Ltd]
 - i. <Insert manufacturer's name>
- C. Constant Volume Fume Hoods with Fiberglass Exterior:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>
- D. Constant Volume Fume Hoods with Polypropylene Exterior:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [NuAire]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [NuAire]
- b. <Insert manufacturer's name>

E. Constant Volume Fume Hoods with VAV Control and Steel Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Air Master Systems, Corp.]
 - b. [Bedcolab]
 - c. [BMC, Inc.]
 - d. [Labcono]
 - e. [Mott Manufacturing Ltd]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Air Master Systems, Corp.]
 - b. [Bedcolab]
 - c. [BMC, Inc.]
 - d. [Labcono]
 - e. [Mott Manufacturing Ltd]
 - f. <Insert manufacturer's name>

F. Constant Volume Fume Hoods with VAV Control and Fiberglass Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>

2.5 BYPASS FUME HOODS

- A. Description: Bypass fume hoods are often called "open bypass," compensating bypass above the sash opening as sash is closed.
1. Provide sufficient bypass capacity so that face velocity with sash opening of **6 inches (150 mm)** does not exceed 3 times the face velocity with sash fully open.

B. Bypass Fume Hoods with Steel Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Air Master Systems, Corp.]**
 - b. **[Bedcolab]**
 - c. **[BMC, Inc.]**
 - d. **[Hanson Lab Solutions]**
 - e. **[iQ LABS]**
 - f. **[Keur Industries, LLC]**
 - g. **[Kewaunee Scientific Corporation]**
 - h. **[Lab Crafters, Inc.]**
 - i. **[Lab Fabricators]**
 - j. **[Labcono]**
 - k. **[Mott Manufacturing Ltd]**
 - l. **[Sheldon Laboratory Systems]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Air Master Systems, Corp.]**
 - b. **[Bedcolab]**
 - c. **[BMC, Inc.]**
 - d. **[Hanson Lab Solutions]**
 - e. **[iQ LABS]**
 - f. **[Keur Industries, LLC]**
 - g. **[Kewaunee Scientific Corporation]**
 - h. **[Lab Crafters, Inc.]**
 - i. **[Lab Fabricators]**
 - j. **[Labcono]**
 - k. **[Mott Manufacturing Ltd]**
 - l. **[Sheldon Laboratory Systems]**
 - m. **<Insert manufacturer's name>**

C. Bypass Fume Hoods with Fiberglass Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[HEMCO Corporation]**
 - b. **[Labcono]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[HEMCO Corporation]**
 - b. **[Labcono]**

c. <Insert manufacturer's name>

D. Bypass Fume Hoods with Stainless Steel Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Baker Company (The)]**
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[Baker Company (The)]**
 - b. <Insert manufacturer's name>

E. Bypass Fume Hoods with Polypropylene Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[NuAire]**
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[NuAire]**
 - b. <Insert manufacturer's name>

F. Bypass Fume Hoods with Auxiliary Air and Steel Exterior:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Air Master Systems, Corp.]**
 - b. **[BMC, Inc.]**
 - c. **[Jamestown Metal Products]**
 - d. **[Kewaunee Scientific Corporation]**
 - e. **[Lab Fabricators]**
 - f. **[Labcono]**
 - g. **[Sheldon Laboratory Systems]**
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Air Master Systems, Corp.]
- b. [BMC, Inc.]
- c. [Jamestown Metal Products]
- d. [Kewaunee Scientific Corporation]
- e. [Lab Fabricators]
- f. [Labcono]
- g. [Sheldon Laboratory Systems]
- h. <Insert manufacturer's name>

G. Bypass Fume Hoods with Auxiliary Air and Fiberglass Exterior:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [HEMCO Corporation]
 - b. [Labcono]
 - c. <Insert manufacturer's name>

H. Restricted-Bypass Fume Hoods with Steel Exterior:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Air Master Systems, Corp.]
 - b. [Lab Crafters, Inc.]
 - c. [Labcono]
 - d. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Air Master Systems, Corp.]
 - b. [Lab Crafters, Inc.]
 - c. [Labcono]
 - d. <Insert manufacturer's name>

I. Restricted-Bypass Fume Hoods with VAV Control and Steel Exterior:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Air Master Systems, Corp.]**
 - b. **[Labcono]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Air Master Systems, Corp.]**
 - b. **[Labcono]**
 - c. **<Insert manufacturer's name>**
- J. Restricted-Bypass Fume Hoods with VAV Control and Fiberglass Exterior:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Labcono]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Labcono]**
 - b. **<Insert manufacturer's name>**

2.6 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
 - 1. For perchloric acid fume hoods, use Type 316L instead of Type 304.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces, and having a flame-spread index of 25 or less according to ASTM E84.
- D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.
 - 1. Physical Properties:
 - a. Flexural Strength: Not less than **10,000 psi (70 MPa)**.
 - b. Modulus of Elasticity: Not less than **2,000,000 psi (1400 MPa)**.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than **260 deg F (127 deg C)**.
 - f. Flame-Spread Index: 25 or less according to ASTM E84.

2. Chemical Resistance: As follows when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
 - a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
 - b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).
 3. Color: **[Black][Gray][Beige][White][As selected by Architect from manufacturer's full range]<Insert color>**.
- E. Polypropylene: Unreinforced polypropylene complying with ASTM D4101, Group 01, Class 1, Grade 2.
- F. Glass: Clear, laminated tempered glass complying with ASTM C1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; **[with two plies not less than 3.0 mm thick and]** with clear, polyvinyl butyral interlayer.
1. Ultraclear Glass: Glass plies each have visible light transmission not less than 91 percent.
 2. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
 3. Permanently mark safety glass with certification label of **[the SGCC][the SGCC or another certification agency acceptable to authorities having jurisdiction][or][the manufacturer]**. Label to indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- G. Polycarbonate Glazing: Clear, uncoated polycarbonate sheet manufactured by extrusion process and complying with the following requirements:
1. Impact Resistance: **12 to 16 ft-lbf/in. (640 to 850 J/m)** according to ASTM D256, Method A.
 2. Elongation and Modulus of Elasticity: 110 percent maximum and **340,000 psi (2345 MPa)**, respectively, according to ASTM D638.
 3. Heat Deflection: **270 deg F (132 deg C)** at **264 psi (1820 kPa)** according to ASTM D638.
 4. Flame-Spread Index: 25 or less according to ASTM E84.
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Fasteners: Provide stainless steel fasteners where exposed to fumes.

2.7 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods to be capable of being partly disassembled as necessary to permit movement through a **35-by-79-inch (889-by-2007-mm)** door opening.
- B. Steel Exterior: Fabricate from steel sheet, **0.048 inch (1.21 mm)** thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
- C. Stainless Steel Exterior: Fabricate from stainless steel sheet, **0.050 inch (1.27 mm)** thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings.

- D. Fiberglass Exterior: Fabricate from glass-fiber-reinforced polyester components not less than **1/4 inch (6.35 mm)** thick, bonded together to maximum extent practical. Trim edges of panels with PVC extrusion. Limit removable parts to access panels, front fascia, and airfoil.
- E. Polypropylene Exterior: Fabricate from fully stress-relieved polypropylene sheet, **1/2 inch (12.7 mm)** thick, with welded seams. Access panels to be **1/4 inch (6.35 mm)** thick, flush mounted, and fastened with flat-head polypropylene screws.
- F. Product Option: Provide either steel or fiberglass exterior as specified above.
- G. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- H. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- I. Interior Lining: Provide[**one of**] the following unless otherwise indicated:
 - 1. Glass-fiber-reinforced polyester, not less than **3/16 inch (4.75 mm)** thick.
 - 2. Epoxy, not less than **1/4 inch (6.35 mm)** thick.
 - 3. Glass-fiber-reinforced epoxy, not less than **3/16 inch (4.75 mm)** thick.
 - 4. Stainless steel, not less than **0.050 inch (1.27 mm)** thick[**with epoxy coating**].
 - 5. Phenolic composite, not less than **1/4 inch (6.35 mm)** thick.
 - 6. Polypropylene, not less than **1/4 inch (6.35 mm)** thick.
 - 7. Unplasticized PVC, not less than **1/4 inch (6.35 mm)** thick.
- J. Lining Assembly: Unless otherwise indicated, assemble with stainless steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.
 - 1. Fasten lining components together with [**stainless**]steel cleats or angles to form a rigid assembly to which exterior panels are attached.
 - 2. Fasten lining components to a rigid frame assembly fabricated from[**stainless**] steel and to which exterior panels are attached.
 - 3. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- K. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece; reinforced to form a rigid assembly to which exterior is attached.
 - 1. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- L. Stainless Steel Lining Assembly: Welded unit consisting of end panels, back panel, top, and work top; reinforced to form a rigid assembly to which exterior is attached.
 - 1. For perchloric acid and radioisotope fume hood linings, cove corners and weld seams completely, and grind surfaces smooth and polish as needed to produce uniform, directionally textured finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- M. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom. Secure baffle to cleats at rear of hood with stainless steel

screws. Fabricate baffle for easy removal for cleaning behind baffle.

1. Provide preset baffles[**unless otherwise indicated**].
 2. Provide adjustable baffles with control adjustment strips at top and bottom with plastic or stainless steel knobs[**unless otherwise indicated**][**where indicated**].
 3. Provide adjustable baffles with remote-control adjustment from outside front of fume hood[**where indicated**].
 4. Provide epoxy-coated, stainless steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
- N. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.
1. Duct-Stub Material: [**Epoxy-coated steel**][**stainless steel**][or][**glass-fiber-reinforced polyester**]<Insert duct material>[**unless otherwise indicated**].
 2. Duct-Stub Material for [**Perchloric Acid**][and][**Radioisotope**] Hoods: Stainless steel.
- O. Bypass Grilles: Provide grilles at bypass openings of fume hoods.
- P. Sashes: Provide operable sashes of type indicated.
1. Fabricate from [**0.050-inch- (1.27-mm-) thick stainless steel**][**0.048-inch- (1.21-mm-) thick steel sheet, with chemical-resistant finish**][or][**PVC extrusions**]. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 2. Glaze with laminated safety glass.
 3. Glaze with **0.236-inch- (6-mm-) thick polycarbonate glazing**[**where indicated**].
 4. Counterbalance vertical-sliding sash with sash weight and stainless steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless steel guides, and stainless steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.
 5. Fabricate horizontal-sliding sashes hung from adjustable nylon-tired, ball-bearing sheaves supported on an overhead stainless steel track. Provide a lower track for guiding sashes only. Sashes to bypass and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash.
 6. Fabricate sashes from **0.236-inch- (6-mm-) thick, unframed polycarbonate** sliding in polypropylene tracks. Counterbalance sashes with PVC-encased weights hung from polypropylene ropes that run over polypropylene pulleys.
- Q. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with **1-inch (25-mm)** space between airfoil and work top. Sash closes on top of airfoil, leaving **1-inch (25-mm)** opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
1. Fabricate airfoil from stainless steel[**coated with polytetrafluoroethylene or polyvinylidene fluoride**].
- R. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with **1/4-inch- (6.35-mm-) thick laminated glass** or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.
1. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.
 2. Provide vaporproof, acid-resistant, incandescent light fixtures complete with 100-W, Type A, long-life bulbs instead of fluorescent fixtures at perchloric acid and radioisotope fume hoods. Provide

two fixtures for hoods up to **60 inches (1524 mm)** long and one fixture for every **24 inches (610 mm)** of length for longer hoods.

- S. Perchloric Acid Fume Hood Washdown System: Provide perchloric acid fume hoods with washdown system consisting of stainless steel spray nozzles, washdown valve, and associated piping. Design system to thoroughly rinse all surfaces of fume hood interior, including areas behind and above baffles, and to direct rinse water toward drain trough at rear of work top. Provide T-fitting for extending system to additional spray nozzles in exhaust ducts.
- T. Filler Strips: Provide as needed to close spaces between fume hoods[**or fume hood base cabinets**] and adjacent building construction. Fabricate from same material and with same finish as fume hoods[**or fume hood base cabinets, as applicable**].
- U. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.
- V. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- W. Comply with requirements in other Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.8 FUME HOOD SYSTEMS

- A. Comply with [Section 123553.13 "Metal Laboratory Casework."][Section 123553.16 "Plastic-Laminate-Clad Laboratory Casework."][Section 123553.19 "Wood Laboratory Casework."][**Provide metal base cabinets in finish matching fume hood exterior finish.**]
- B. Work Tops: [Epoxy][Phenolic composite][Epoxy or phenolic composite][Stainless steel][**As indicated**].
 - 1. Work-Top Configuration: Raised (marine) edge with [beveled][or][rounded] edge and corners.
 - 2. Where acid storage cabinets are indicated beneath fume hoods, provide holes in work tops as need to accommodate cabinet vents.
 - 3. Where epoxy sinks occur in epoxy work tops, provide integral sinks bonded to tops with invisible joint line.
 - 4. Where epoxy sinks occur in phenolic-composite work tops, provide drop-in sinks with **1/4-inch (6-mm)** thick lip around perimeter of sink.
 - 5. Where stainless steel sinks, cup sinks, or troughs occur in stainless steel tops, factory weld into one integral unit.
 - 6. For perchloric acid fume hoods, provide stainless steel work tops with **1/2-inch (13-mm)** raised front edge and integral drain trough at back of top with top sloped to trough.
- C. Cup Sinks: [Epoxy][Polypropylene][Stainless steel], [3-by-6-inch (75-by-150-mm) oval][3-by-9-inch (75-by-228-mm) oval][5-inch (127-mm) diameter][**Material and size as indicated**].
 - 1. Provide with [polypropylene][stainless steel] strainers and integral tailpieces.
 - 2. Provide [epoxy][and][polypropylene] cup sinks with polypropylene strainers and integral tailpieces.
 - 3. Provide stainless steel cup sinks with stainless steel strainers and integral tailpieces.
- D. Work Surface of Floor-Mounted Fume Hoods: Integral floor with **1/2-inch- (13-mm-)** high, raised (marine) edge.

1. Solid epoxy floor, **1 inch (25 mm)** thick.
 2. Solid phenolic-composite floor, **1 inch (25 mm)** thick.
 3. Stainless steel floor pan.
- E. Structural Performance of Radioisotope Fume Hood Components: Capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:
1. Work Tops: **200 lb/ft. (297 kg/m)**.
 2. Base Cabinets: **75 lb/ft. (112 kg/m)** within cabinets, **50-lb/ft. (74-kg/m)** work top, **200 lb/ft. (297 kg/m)** on work top, plus weight of hood.
- F. Fume Hood Base Stands: Welded steel tubing legs, not less than **2 inches (50 mm)** square with channel stretchers and aprons. Weld or bolt stretchers to legs and cross-stretchers, and bolt legs to aprons. Provide leveling device welded to bottom of each leg.
1. Structural Performance[**except for Fume Hood Base Stands for Radioisotope Hoods**]: Capable of withstanding **50-lb/ft. (74-kg/m)** work top, **75 lb/ft. (112 kg/m)** on work top, plus weight of hood, without permanent deformation or excessive deflection.
 2. Structural Performance of Fume Hood Base Stands for Radioisotope Hoods: Capable of withstanding **50-lb/ft. (74-kg/m)** work top, **200 lb/ft. (297 kg/m)** on work top, plus weight of hood, without permanent deformation or excessive deflection.
 3. Knee Space: Provide clear floor space not less than [**30 inches (760 mm)**][**36 inches (915 mm)**] wide by **25 inches (635 mm)** deep by **27 inches (685 mm)** high within fume hood base stands unless otherwise indicated.
 4. Leg Shoes: [**Black vinyl or rubber**][**Satin-finished stainless steel**], open-bottom, slip-on type.

2.9 CHEMICAL-RESISTANT FINISH

- A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8M. Acceptance level for chemical spot test to be no more than four Level 3 conditions.
 2. Colors for Fume Hood Finish: [**As indicated by manufacturer's designations**][**Match Architect's samples**][**As selected by Architect from manufacturer's full range**].

2.10 ACCESSORIES

- A. Airflow Indicator: Provide each fume hood with[**manufacturer's standard**] airflow indicator [**of the following indicator type**][**of one of the following indicator types**]:
1. Direct-reading aneroid (Magnehelic-type) gage that measures exhaust duct static pressure of fume hood as an indication of airflow.

2. Thermal anemometer that measures fume hood face velocity and indicates whether it is below normal, normal, or above normal.
 3. Thermal anemometer that measures fume hood face velocity and displays data as digital readout.
- B. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.
1. Provide with **[thermal-anemometer][or][aneroid (Magnehelic-type) gage]** airflow sensor.
 2. Provide with reset and test switches.
 3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.
- C. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.
1. Provide with silence and test switches.
- D. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.
- E. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Comply with requirements in **[Section 123553.13 "Metal Laboratory Casework"]****[Section 123553.16 "Plastic-Laminate-Clad Laboratory Casework"]****[Section 123553.19 "Wood Laboratory Casework"]** for installing fume hood base cabinets, work tops, and sinks.
- C. Comply with requirements for installing water and laboratory gas service fittings and electrical devices.
 1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work-top material. Securely anchor fittings to

fume hoods unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to "Flow Visualization and Velocity Procedure" requirements in ASHRAE 110.
 - 1. Test one installed fume hood, selected by Architect, for each type of hood installed, according to ASHRAE 110[**as modified in "Performance Requirements" Article**].[**If tested hood fails to meet performance requirements, field test additional hoods as directed by Architect.**]
- B. Field test installed fume hoods according to ASHRAE 110[**as modified in "Performance Requirements" Article**] to verify compliance with performance requirements.
 - 1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 - 2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.5 FUME HOOD SCHEDULE

- A. Bench-Top Fume Hood: Type FH-<#>.
 - 1. Exterior: [**Steel with chemical-resistant finish**][**Fiberglass**][**Steel with chemical-resistant finish or fiberglass**][**Stainless steel**][**Polypropylene**].
 - 2. Ventilation Type: [**Constant volume**][**Constant volume, with VAV control**][**Bypass**][**Auxiliary-air bypass**][**Restricted bypass**][**Restricted bypass, with VAV control**].
 - 3. ASHRAE 110 As-Manufactured (AM) Rating: [**AM 0.05 (0.05 ppm)**][**AM 0.02 (0.02 ppm)**][**AM 0.01 (0.01 ppm)**]<Insert rating>.
 - 4. ASHRAE 110 As-Installed (AI) Rating: [**AI 0.10 (0.10 ppm)**][**AI 0.05 (0.05 ppm)**]<Insert rating>.
 - 5. Sash Configuration:
 - a. Operation:
 - 1) Vertical-sliding, single-hung sash.
 - 2) [**Two**][**Three**][**Four**] horizontal-sliding, bypassing sashes.
 - 3) Combination sash consisting of [**two**][**three**][**four**] horizontal-sliding, bypassing sashes retained in a vertical-sliding, single-hung frame.
 - b. Opening Height: [**27 to 30 inches (685 to 762 mm)**]<Insert dimensions>.
 - 6. Work Top: [**Epoxy**][**Phenolic composite**][**Epoxy or phenolic composite**][**Stainless steel**].
 - 7. Cup Sinks: [**Epoxy**][**Polypropylene**][**Stainless steel**], [**3-by-6-inch (75-by-150-mm) oval**][**3-by-9-inch (75-by-228-mm) oval**][**5-inch (127-mm) diameter**].
 - 8. Service Fittings:

- a. Water: **[One][Two]** remote-control, rigid, gooseneck, single-service faucet(s) with vacuum breaker and removable serrated outlet.
- b. Laboratory Gas for **[Air][Gas (Fuel Gas)][Vacuum]<Insert service>**: **[One][Two]** flange-type fitting(s) with **[straight][angled]** outlet and remote-control **[ground-key cock][ball valve][needle valve]**.
- c. Electrical: **[One duplex receptacle][Two duplex receptacles][One switched receptacle][One duplex receptacle, switch, and pilot light]** at **[one][both]** end(s) of hood, mounted on exterior front face of end pilaster.

- 1) Provide **[GFCI][TVSS]** receptacles.

- 9. Additional Requirements: Comply with requirements for **[perchloric acid][radioisotope]** fume hoods.

B. Floor-Mounted Fume Hood: Type FH-<#>.

- 1. Exterior: **[Steel with chemical-resistant finish][Fiberglass][Steel with chemical-resistant finish or fiberglass][Stainless steel][Polypropylene]**.
- 2. Ventilation Type: **[Constant volume][Constant volume, with VAV control][Bypass][Auxiliary-air bypass][Restricted bypass][Restricted bypass, with VAV control]**.
- 3. ASHRAE 110 As-Manufactured (AM) Rating: **[AM 0.05 (0.05 ppm)][AM 0.02 (0.02 ppm)][AM 0.01 (0.01 ppm)]<Insert rating>**.
- 4. ASHRAE 110 As-Installed (AI) Rating: **[AI 0.10 (0.10 ppm)][AI 0.05 (0.05 ppm)]<Insert rating>**.
- 5. Sash Configuration:

- a. Operation:

- 1) Vertical-sliding, independently operable, double-hung sashes.
- 2) **[Two][Three][Four]** horizontal-sliding, bypassing sashes with a **2-inch (50-mm)** opening below sashes.

- b. Opening Height: **[58 inches (1473 mm)][66 inches (1676 mm)]<Insert dimension>**.

- 6. Floor: **[Epoxy][Phenolic composite][Epoxy or phenolic composite][Stainless steel]**.
- 7. Cup Sinks: **[Epoxy][Polypropylene][Stainless steel]**, **[3-by-6-inch (75-by-150-mm) oval][3-by-9-inch (75-by-228-mm) oval][5-inch (127-mm) diameter]**.
- 8. Service Fittings:

- a. Water: **[One][Two]** remote-control, rigid, gooseneck, single-service faucet(s) with vacuum breaker and removable serrated outlet.
- b. Laboratory Gas for **[Air][Gas (Fuel Gas)][Vacuum]<Insert service>**: **[One][Two]** flange-type fitting(s) with **[straight][angled]** outlet and remote-control **[ground-key cock][ball valve][needle valve]**.
- c. Electrical: **[One duplex receptacle][Two duplex receptacles][One switched receptacle][One duplex receptacle, switch, and pilot light]** at **[one][both]** end(s) of hood, mounted on exterior front face of end pilaster.

- 1) Provide **[GFCI][TVSS]** receptacles.

END OF SECTION 11 53 13 00



Task	Specification	Specification Description
11 53 13 11	11 53 13 00	Laboratory Fume Hoods
11 53 43 00	01 11 19 00	No Specification Required
11 66 13 00	01 11 19 00	No Specification Required
11 66 13 00	11 66 23 00	Gymnasium Equipment



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SECTION 11 66 23 00 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basketball equipment.
2. Volleyball equipment.
3. Badminton equipment.
4. Exercise equipment.
5. Safety pads.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for [installation of floor-insert sleeves][oversized recessed voids] to be cast in concrete slabs and footings.
2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
3. Section 096566 "Resilient Athletic Flooring" for game lines and markers.
4. Section 096766 "Fluid-Applied Athletic Flooring" for game lines and markers.
5. Section 116653 "Gymnasium Dividers" for gymnasium divider curtain systems.

1.2 DEFINITIONS

- A. BWF: Badminton World Federation.
- B. FIBA: Federation Internationale de Basketball (The International Basketball Federation).
- C. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).
- D. NBA: National Basketball Association.
- E. NCAA: The National Collegiate Athletic Association.
- F. NFHS: National Federation of State High School Associations.
- G. WNBA: Women's National Basketball Association.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
4. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, and operational clearances.
3. Include transport and storage accessories for removable equipment.
4. Include diagrams for power, signal, and control wiring.

D. Samples: For each exposed product and for each item and color specified.

E. Samples for Initial Selection: For each type of gymnasium equipment.

F. Samples for Verification: For the following products:

1. Basketball Net: Full size.
2. **[Volleyball][Badminton]** Net: Minimum **12-inch (305-mm)** length by full height, including one edge and net accessories.
3. **[Volleyball][Badminton]** Floor Insert: Full-size unit.
4. **[Volleyball][Badminton]** Post Standard: Full-size unit **[with net tensioner]**.
5. Pad Fabric: Wall padding minimum **3 inches (76 mm)** square[, and corner and column **Samples minimum 3 inches (76 mm) long]**, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Court layout plans, reflected ceiling plans, and other details, drawn to scale, and coordinated with ceiling-suspended gymnasium equipment, floor inserts, game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved:

1. Structural members to which overhead-supported gymnasium equipment will be attached.
2. Suspended ceiling components, if any.
3. Items supported from building structure above the courts, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Acoustical treatments or panels.
 - g. Access panels.

h. <Insert item>.

- B. Setting Drawings: For embedded items and cutouts required in other work.
- C. Qualification Data: For Installer.
- D. Product Certificates: For each type of gymnasium equipment.
- E. Field quality-control reports.
- F. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: **[Fabricator of products][An entity that employs installers and supervisors who are trained and approved by manufacturer].**

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of **[gymnasium equipment]<Insert item>** that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures, including glass breakage.
 - b. Faulty operation of basketball backstops.
 - 2. Warranty Period: **[Five][10][25]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
- B. Revise articles below to suit Project. These include paragraphs that are examples of gymnasium equipment and are not intended to be all inclusive. Indicate individual equipment or assembled system dimensions and elevations on Drawings. Use these example paragraphs as guides for developing paragraphs for other types of gymnasium equipment.

2.2 BASKETBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[AALCO Manufacturing]**
 2. **[ADP Lemco]**
 3. **[Arizona Courtlines, Inc.]**
 4. **[Basketball Products International]**
 5. **[Bison, Inc.]**
 6. **[Douglas Industries, Inc.]**
 7. **[Draper, Inc.]**
 8. **[IPI by Bison]**
 9. **[Jaypro Sports, LLC]**
 10. **[L.A. Steelcraft, a brand of Americana Outdoor]**
 11. **[P. W. Athletic Mfg. Co.]**
 12. **[Performance Sports Systems]**
 13. **[Porter Athletic Equipment Company]**
 14. **[Schelde Sports]**
 15. **[Spalding]**
 16. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[AALCO Manufacturing]**
 2. **[ADP Lemco]**
 3. **[Arizona Courtlines, Inc.]**
 4. **[Basketball Products International]**
 5. **[Bison, Inc.]**
 6. **[Douglas Industries, Inc.]**
 7. **[Draper, Inc.]**
 8. **[IPI by Bison]**
 9. **[Jaypro Sports, LLC]**
 10. **[L.A. Steelcraft, a brand of Americana Outdoor]**
 11. **[P. W. Athletic Mfg. Co.]**
 12. **[Performance Sports Systems]**
 13. **[Porter Athletic Equipment Company]**
 14. **[Schelde Sports]**
 15. **[Spalding]**
 16. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Standard Rules: Provide equipment according to the requirements of **[FIBA's "Official Basketball Rules - Basketball Equipment."][NBA's "Official Rules of the National Basketball Association."][NCAA's "Men's Basketball Rules."][NCAA's "Women's Basketball Rules."][NFHS's "Basketball Rules Book."][WNBA's "Official Rules of the Women's National Basketball Association."]**
- E. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- F. Connections: Manufacturer's standard connections or connections recommended in writing by manufacturer and complying with Section 055000 "Metal Fabrications" of size and type required to

transfer loads to building structure.

G. Overhead-Supported[, **Wall-Braced**] Backstops:

1. Stationary Type: Manufacturer's standard assembly.
2. Folding Type: Manufacturer's standard assembly for **[forward-folding, front-braced][forward-folding, rear-braced][backward-folding][side-folding]** backstop, with hardware and fittings to permit folding.
3. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.
 - a. Center-Mast Frame: **[Welded][Welded and bolted or clamped]** with side sway bracing.
 - b. Dual-Mast Frame: **[Welded][Welded and bolted or clamped]** with cross bracing.
 - c. Finish: Manufacturer's standard **[primer for field finishing][polyester powder-coat finish]**.
4. Goal Height Adjuster: Adjustable from **8 to 10 feet (2.40 to 3.05 m)** to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation:
 - 1) Manual operation with detachable crank handle.
 - 2) Electrical: Electric operation with integral gear-drive motor, with limit switches preset to goal heights and the following:
 - a) Key switch control.
 - b) **[One]<Insert number>** detachable electric control device(s).
 - c) Wireless remote control.

H. Wall-Mounted Backstops: Complete assembly extending from wall, including support framing to building structure, bracing, cables, support chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners.

1. Stationary Type: Manufacturer's standard assembly for stationary backstop.
2. Folding Type: Manufacturer's standard assembly for **[upward][side]**-folding backstop.
3. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.
 - a. Finish: Manufacturer's standard **[primer for field finishing][polyester powder-coat finish]**.
4. Extension: **[6 inches (152 mm)][12 inches (305 mm)][18 inches (460 mm)][24 to 48 inches (610 to 1220 mm)][48 to 120 inches (1220 to 3050 mm)][As indicated on Drawings]<Insert dimension(s)>**.
5. Goal Height Adjuster: Adjustable from **8 to 10 feet (2.40 to 3.05 m)** to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation:
 - 1) Manual: Manual operation with detachable crank handle.
 - 2) Electrical: Electric operation with integral gear-drive motor, with limit switches preset to goal heights, and **[one]<Insert number>** detachable electric control device(s).

I. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; **[6000-lb (2700-kg)]<Insert value>** load capacity; **[one per folding backstop][where indicated]**.

1. Retractor Device: **[Pulley-type][Spring-activated, reel-type][Manufacturer's standard]** device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; **[one per folding backstop][where indicated]**.
- J. Winch: Hoist consisting of heavy-duty, fully enclosed worm-gear; brake; cable drum; cable; and fittings, for mounting on **[wall with equipment-mounting board]<Insert requirement>**; designed to move and hold backboard in any raised or lowered position.
1. Operation: Manual winch with detachable hand crank.
 2. Portable Winch Operator: **[One]<Insert number>** portable electric motor-drive device(s), including adaptor to fit crank mechanism.
- K. Backstop Electric Operator: Provide operating machine of size and capacity recommended in writing by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 3. Operator Mounting: **[On wall with equipment-mounting board]<Insert requirement>**.
 4. Motor Electrical Characteristics:
 - a. Horsepower: **[1/2][3/4][1]<Insert number>** hp.
 - b. Voltage: 115 V ac, single phase, 60 hertz.
 5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for **[surface][recessed or flush]<Insert requirement>** mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.
 - a. Group Key Switch Control Stations: One switch per **[each backstop][two backstops]<Insert requirement>**.
 - b. Keys: Provide **[one key][two keys][one set of dual keys][two sets of dual keys][dual keys, one key for up and one for down]** per station.
 - c. Switches, Ganged: Single faceplate with multiple switch cutouts **[for two switches operating four backstops][for three switches operating six backstops][for four switches operating eight backstops][for five switches operating 10 backstops][for six switches operating 12 backstops][as indicated on Drawings]**.
 - d. Control Station Enclosure: Provide prime-painted metal enclosure with **[integrally formed padlock hasps][key access, with two sets of keys per enclosure]**.
 - e. Radio Controls: One per backstop winch and **[two]<Insert number>** portable multiple-channel transmitters for operating **[two][four][up to nine]<Insert number>** backstops individually with up and down functions.
 6. Limit Switches: Adjustable switches at each backstop, interlocked with motor controls and set to automatically stop backstop at fully retracted and fully lowered positions.
- L. Basketball Backboards:
1. Shape and Size:
 - a. Rectangular, **[72 by 42 inches (1830 by 1070 mm)][72 by 48 inches (1830 by 1220 mm)]<Insert dimensions>** width by height, **with rounded corners**.
 - b. Fan-shaped, **54-inch (1370-mm)** maximum width by **[35-inch (890-mm)][39-inch (990-**

mm)] maximum height.

2. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Fiberglass: Minimum **1-1/2-inch- (38-mm-)** thick, composite backboard consisting of minimum two **3/16-inch- (5-mm-)** thick, molded-fiberglass panels laminated together over faces and edges encapsulating a **3/4-inch (19-mm)** honeycomb core, reinforced at goal and backboard mountings, or a wood panel product core; with threaded inserts or embedded anchors for mounting backboard corners to support framing at standard mounting centers.
 - b. Glass: Minimum **1/2-inch- (13-mm-)** thick, transparent tempered glass according to ASTM C1048 Kind FT (fully tempered) and with impact-testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. **[Provide glass and framing system manufactured according to FIBA Level 1 or Level 2 requirement that glass does not split off if broken.]**
 - 1) Frame: Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, **[painted steel][brushed-natural-finish, extruded-aluminum]** frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.
 - 2) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop at standard mounting centers. **[Provide center-strut frame reinforcement.]**
 - 3) Direct Mount: Designed for mounting backboard frame to center mast of backstop, to maximize stress relief on backboard frame and glass.
 - 4) Rim-Restraining Device: According to NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
 - c. Steel: Single-piece, steel face sheet, minimum **[0.1046-inch (2.7-mm)]<Insert dimension>** nominal thickness, with **1-1/2-inch- (38-mm-)** deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backstop at standard mounting centers.
 - d. Hardwood or Particleboard: Minimum **1-1/2-inch- (38-mm-)** thick backboard consisting of minimum **1/32-inch- (0.8-mm-)** thick, phenolic-resin-impregnated cellulose and paper laminate over front and back sides of **1-1/2-inch (38-mm)** hardwood or particleboard core; with painted edges and corners and with threaded inserts or slotted brackets for mounting backboard corners to backstop at standard mounting centers.
3. Target Area and Border Markings for Clear Tempered Glass: Permanently etched in white color, marked in **[pattern and stripe width according to referenced standard rules][manufacturer's standard pattern and stripe width]**.
4. Target Area and Border Markings for Opaque Surfaces: Marked in **[pattern, stripe width, and color according to referenced standard rules][orange, with manufacturer's standard pattern and stripe width][black, with manufacturer's standard pattern and stripe width]**.
5. Finish: Manufacturer's standard factory-applied, white background.
- M. Goal-Mounting Assembly: Compatible with goal, backboard, and backstop; with **[5-inch (127-mm) o.c. horizontally and vertically][5-inch (127-mm) o.c. horizontally and 4-inch (102-mm) o.c. vertically][5-inch (127-mm) o.c. horizontally and 4-1/2 inch (114 mm) o.c. vertically][manufacturer's standard]<Insert dimensions>** hole pattern for goal attachment.
 1. Glass Backboard Goal-Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backstop and to minimize stresses on glass backboard.
 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop, so that no force is transmitted by ring directly to backboard, and rigidity and stability of goal are

maximized.

- N. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication **[complying with referenced standard rules][per manufacturer's standard design]**.
 2. Double-Rim Basket Ring: Fabricated with two rims, **[each consisting of a 5/8-inch- (16-mm-) diameter][consisting of one 1/2-inch- (13-mm-) diameter and one 5/8-inch- (16-mm-) diameter][manufacturer's standard-diameter]<Insert description>** steel rod welded into **18-inch (460-mm)** ID rings.
 3. Type:
 - a. Fixed: Nonmovable.
 - b. Movable: Pressure-release design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
 4. Pressure-Release Characteristics: Positive-lock movable breakaway design, with manufacturer's standard mechanism, including preset pressure release, set to release **[between 181- and 231-lb (82- and 105-kg)][at more than 100-lb (45.4-kg)]<Insert value(s)>** load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 5. Field Adjustment: Provide ring that is field adjustable for rebound elasticity without being removed from the backboard.
 6. Mount: **[Front][Rear]**.
 7. Net Attachment: **[No-tie loops for attaching net to ring without tying][Tube tie for attaching net to ring]**.
 8. Finish: **[Manufacturer's standard][Polyester powder-coat]** finish.
- O. Basketball Nets: 12-loop-mesh net, between **15 and 18 inches (380 to 460 mm)** long, sized to fit ring diameter, and as follows:
1. Cord: Made from white **[cotton][nylon]**.
 2. Competition Cord: Antiwhip, made from white nylon cord, minimum 120-gm thread and maximum 144-gm thread.
- P. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop **[as required by referenced standard rules][according to manufacturer's standard design][and][as indicated on Drawings]**.
1. Attachment: **[Peel-and-stick tape][Adhesive][Bolt on][Manufacturer's standard]**.
 2. Color: **[Black][Gray][Manufacturer's standard color][As selected by Architect from manufacturer's full range]**.

2.3 VOLLEYBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[AALCO Manufacturing]**
 2. **[ADP Lemco]**
 3. **[Arizona Courtlines, Inc.]**
 4. **[Bison, Inc.]**
 5. **[Douglas Industries, Inc.]**

6. [Draper, Inc.]
 7. [IPI by Bison]
 8. [Jaypro Sports, LLC]
 9. [L.A. Steelcraft, a brand of Americana Outdoor]
 10. [P. W. Athletic Mfg. Co.]
 11. [Performance Sports Systems]
 12. [Porter Athletic Equipment Company]
 13. [Schelde Sports]
 14. [Spalding]
 15. [Sports Imports, Inc.]
 16. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [AALCO Manufacturing]
 2. [ADP Lemco]
 3. [Arizona Courtlines, Inc.]
 4. [Bison, Inc.]
 5. [Douglas Industries, Inc.]
 6. [Draper, Inc.]
 7. [IPI by Bison]
 8. [Jaypro Sports, LLC]
 9. [L.A. Steelcraft, a brand of Americana Outdoor]
 10. [P. W. Athletic Mfg. Co.]
 11. [Performance Sports Systems]
 12. [Porter Athletic Equipment Company]
 13. [Schelde Sports]
 14. [Spalding]
 15. [Sports Imports, Inc.]
 16. <Insert manufacturer's name>
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Standard Rules: Provide equipment according to the requirements of [FIVB's "Official Volleyball Rules."][NCAA's "Women's Volleyball Rules and Interpretations."][NFHS's "Volleyball Rules Book."]
- E. Floor Insert: [Solid-brass][Chrome-finished steel] floor plate and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, minimum [9 inches (230 mm) long][12 inches (305 mm) long][length required], to securely anchor pipe sleeve [in structural floor][below finished floor in concrete footing][as indicated on Drawings]; with anchors designed for securing floor insert to floor substrate indicated; [one per post standard][quantity as indicated on Drawings]<Insert requirement>.
1. Flush Floor Plate: [Self-locking,][Lockable,][Manufacturer's standard] hinged access cover, designed to be flush with adjacent flooring. Provide [one][two]<Insert number> tool(s) for unlocking access covers.
 2. Recessed Floor Plate: [Self-locking,][Lockable,][Manufacturer's standard] hinged access cover, recessed to accept finish flooring matching, and designed to be level with adjacent flooring. Provide [one][two]<Insert number> tool(s) for unlocking access covers.
 3. Floating Wood Floor, Floor Plate: Lockable swivel access cover, designed for use with floating wood floors and to be flush with adjacent flooring. Provide [one][two]<Insert number> tool(s) for unlocking access covers.
 4. Floor Plate: <Insert requirements>.

- F. Post Standards: Removable, **[fixed-height][adjustable-height, telescoping,]** paired volleyball post standards **[and a center post standard for multicourt play]**, as indicated on Drawings, designed for easy removal from permanently placed floor inserts.
1. Materials: **[Steel][Extruded-aluminum][Combined steel and extruded-aluminum][Manufacturer's standard metal]** pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring.
 2. Nominal Pipe or Tubing Diameter: **[3-inch (76-mm)][3-1/2-inch (89-mm)][4-inch (102-mm)]** OD at base.
 3. Finish: Manufacturer's standard **[factory-applied, polyester powder-coat finish][or][plated metal finish]**.
 4. Net Height Adjuster: **[Track or rail system and lock mechanism, designed for infinite][Sliding collar and lock mechanism, designed for infinite][Preset net hooks, designed for incremental][Manufacturer's standard mechanism for]** height adjustment, complete with fittings; designed for positioning net at heights indicated.
 - a. Net Heights: **[Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm)][Between tennis net height and boys'/men's volleyball net height, 42 and 95-5/8 inches (1070 and 2430 mm)][For ages 12 and under net height and boys'/men's volleyball net height, 84 and 95-5/8 inches (2130 and 2430 mm)]<Insert net height range>** or more.
 5. Telescopic and Net Height Adjuster System: Provide **[infinitely adjustable system consisting of screw rod, gear, and crank or constant-tension spring and pulley assist and][incrementally adjustable system with predrilled holes and pin][manufacturer's standard telescoping system with]** locking device, telescopic post, and fittings for holding net at selected height; designed for height adjustment of post standard to position net at heights indicated.
 - a. Net Heights: **[Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm)][Between tennis net height and boys'/men's volleyball net height, 42 and 95-5/8 inches (1070 and 2430 mm)][For ages 12 and under net height and boys'/men's volleyball net height, 84 and 95-5/8 inches (2130 and 2430 mm)]<Insert net height range>** or more.
 6. Height Markers: Clearly marked at regulation play heights for **[elementary school][girls/women][boys/men][sitting volleyball][tennis]<Insert requirements>**.
- G. Net: **32 feet (9.75 m)** long; **[one per pair of paired post standards][two per every center post standard]<Insert requirements>**; and as follows:
1. Width and Polyester Mesh: **36 inches (910 mm)** with **4-1/2-inch- (114-mm-)** square mesh made of black polyester string.
 - a. Hem Band Edges: White, **2-inch- (50-mm-)** wide top binding; black, **[3/4-inch- (19-mm-)][1-inch- (25-mm-)]** wide bottom and side bindings; tie offs at top and bottom of each side end of net; and **1/4-inch- (6-mm-)** diameter rope, at least **42 feet (12.8 m)** long, threaded through top hem of binding.
 2. Width and Nylon Mesh: Competition volleyball net, **[36 inches (910 mm)][39 inches (990 mm)]** with **4-inch- (102-mm-)** square **[knotless]** mesh made of black nylon string.
 - a. Hem Band Edges: White, minimum **2-inch- (50-mm-)** wide top, bottom, and side bindings; **[tie offs at top, bottom, and midpoint of each side end of net][minimum 1-inch- (25-mm-)]** wide tension straps at top, bottom, and midpoint of each side end of net; end

sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post-standard spacing indicated on Drawings.

- 1) Top Line: Minimum **[1/4-inch- (6-mm-) diameter rope][1/8-inch- (3-mm-) diameter, galvanized- or coated-steel cable]<Insert description>**.
 - 2) Bottom Line: Minimum **[1/4-inch- (6-mm-) diameter rope][1/8-inch- (3-mm-) diameter, galvanized- or coated-steel cable]<Insert description>**.
3. Dowels: Minimum **1/2-inch- (13-mm-) diameter** fiberglass or **1-inch- (25-mm-) diameter** wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 4. Net Antennas: **3/8-inch- (9.5-mm-) diameter**, high-tensile-strength, extruded-fiberglass or plastic rods, **72 inches (1830 mm)** long, extending above top hem band of net, with alternating white and red bands according to referenced standard rules. Provide two antennas per net.
 - a. Clamps: Designed to secure antenna to top and bottom of net.
 5. Boundary Tape Markers: **2-inch- (50-mm-) wide white strip[with sleeve for securing net antenna]**, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- H. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip, **[worm-gear][rack-and-pinion][ratchet][manufacturer's standard]**-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and **[permanently fixed][removable][manufacturer's standard]** handle. **[Mount net tensioner on post standard at side away from court.]** Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- I. Bottom Net Lock Tightener: Manufacturer's standard quick-release-type tension strap; a spring-loaded, self-locking tensioner; a turnbuckle; a pulley; or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
- J. Judges' Stands: Manufacturer's standard **[adjustable-height]** units designed to be **[freestanding, folding for storage][freestanding, folding for storage with wheels for transporting][attached to and supported by post standard]**. Fabricate welded-steel tubing units with finish and color to match post standards.
- K. Safety Pads: Consisting of minimum **[1-inch- (25-mm-)][1-1/4-inch- (32-mm-)]** thick, multiple-impact-resistant **[polyurethane][crosslinked or closed-cell polyethylene][manufacturer's standard]** foam filler covered by puncture- and tear-resistant fabric cover, **[minimum 14-oz./sq. yd. (475-g/sq. m) PVC-coated polyester, treated with fungicide for mildew resistance][, minimum 14-oz./sq. yd. (475-g/sq. m) nylon-reinforced PVC][, molded PVC][, manufacturer's standard]<Insert description>**; with fire-test-response characteristics indicated, **[and lined with fire-retardant liner]**. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: **[Wraparound][three- or four-sided]** style pads, designed to totally enclose each standard to a minimum height of **[66 inches (1680 mm)][72 inches (1830 mm)]**; one per post.
 2. Net Lines: Four per net.
 3. Judges' Stands: Pads designed to totally enclose front and sides.
 4. Fabric Cover Flame-Resistance Ratings: **[Complies with NFPA 701]<Insert requirement for fire-test-response characteristic>**.
 5. Fabric Color: **[Match school colors][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry standard colors and color densities]<Insert color(s)>**.
 6. Graphics: Custom graphics as indicated on Drawings.

- L. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- M. Wall Storage Rack: Manufacturer's standard unit designed for mounting on walls and for storing post standards in vertical position, with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment.
- N. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through [36-inch- (910-mm-)]<Insert dimension> wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.4 BADMINTON EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [AALCO Manufacturing]
 - 2. [ADP Lemco]
 - 3. [Arizona Courtlines, Inc.]
 - 4. [Bison, Inc.]
 - 5. [Draper, Inc.]
 - 6. [IPI by Bison]
 - 7. [Jaypro Sports, LLC]
 - 8. [Performance Sports Systems]
 - 9. [Porter Athletic Equipment Company]
 - 10. [Schelde Sports]
 - 11. [Spalding]
 - 12. [Sports Imports, Inc.]
 - 13. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [AALCO Manufacturing]
 - 2. [ADP Lemco]
 - 3. [Arizona Courtlines, Inc.]
 - 4. [Bison, Inc.]
 - 5. [Draper, Inc.]
 - 6. [IPI by Bison]
 - 7. [Jaypro Sports, LLC]
 - 8. [Performance Sports Systems]
 - 9. [Porter Athletic Equipment Company]
 - 10. [Schelde Sports]
 - 11. [Spalding]
 - 12. [Sports Imports, Inc.]
 - 13. <Insert manufacturer's name>
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Standard Rules: Provide equipment according to the requirements of BWF's "Laws of Badminton."

- E. Floor Insert: Solid-brass floor plate with **[hinged]** access cover and steel pipe sleeve with capped bottom end; sized with ID to fit post standards, minimum **[5-1/4 inches (133 mm) long][length required]** to securely anchor pipe **[in structural floor][below finished floor in concrete footing][as indicated on Drawings]**; **[one per post standard][quantity as indicated on Drawings]<Insert requirement>**.
- F. Floor-Insert Adaptor: Pipe sleeve adaptor to convert volleyball floor-insert sleeve to fit badminton post standard; **[one per badminton post standard][quantity as indicated on Drawings]<Insert requirement>**.
- G. Post Standards: Paired badminton post standards **[and a center post standard for multicourt play]**, designed for easy removal from permanently placed floor inserts.
 - 1. Material: Steel pipe or tubing, with plastic or rubber end cap or nonmarking floor bumper to protect permanent flooring.
 - 2. Nominal Pipe or Tubing Diameter: **[1-1/2-inch (38-mm)][2-3/8-inch (60-mm)]** OD at base.
 - 3. Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.
 - 4. Net Height Setting: By **[preset net hooks][or][adjustable mechanism]**.
- H. Net: Competition badminton net, **20 feet (6.1 m)** long and as follows; **[one per pair of paired post standards][two per every center post standard]<Insert requirements>**:
 - 1. Width and Mesh: **30 inches (760 mm)** with **3/4-inch- (19-mm-)** square mesh made of purple, dark brown, or black nylon string.
 - a. Hem Band Edges: White, **3-inch- (76-mm-)** wide top binding; purple, dark brown, or black **3/4-inch- (19-mm-)** wide bottom and side bindings; **[tie offs at top, bottom, and midpoints,][sleeve with dowel,]** eliminating gap at each side end of net; and minimum **1/8-inch- (3-mm-)** diameter rope, at least **42 feet (12.8 m)** long, threaded through top hem of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post-standard spacing indicated on Drawings.
- I. Wall Storage Rack: Manufacturer's standard unit designed for mounting on walls and for storing post standards in vertical position, with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment.
- J. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing badminton equipment and passing through **[36-inch- (910-mm-)]<Insert dimension>** wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.5 EXERCISE EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Arizona Courtlines, Inc.]**
 - 2. **[Draper, Inc.]**
 - 3. **[Jaypro Sports, LLC]**
 - 4. **[Performance Sports Systems]**
 - 5. **[Porter Athletic Equipment Company]**
 - 6. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Arizona Courtlines, Inc.]**
 2. **[Draper, Inc.]**
 3. **[Jaypro Sports, LLC]**
 4. **[Performance Sports Systems]**
 5. **[Porter Athletic Equipment Company]**
 6. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Pull-up Bar: Wall mounted.
1. Fixed height.
 2. Adjustable Height: In **6-inch (152-mm)** increments within a range of **[18 inches (460 mm)][30 inches (760 mm)]<Insert dimension>**.
 3. Bar Length: Minimum **[36 inches (910 mm)][40 inches (1010 mm)][As indicated on Drawings]<Insert dimension>**.
 4. Bar: Minimum **1-1/16-inch- (27-mm-)** diameter, round, plated solid-steel bar.
 5. Support Frame: Steel-angle end brackets attached to wood stringers, steel channels, or bars.
 6. Bar Installation Height and Wall Clearance: Height **[as indicated on Drawings]<Insert dimension>** and minimum **12 inches (305 mm)** from wall.
- E. Stall Bars: Wall mounted in a continuous row; each vertical section with no fewer than 16 rungs.
1. Size: Each section **[96 inches (2440 mm) high by 36 inches (910 mm) wide][as indicated on Drawings]<Insert dimension(s)>**.
 2. Side Rails: Formed-steel tube uprights minimum **1-1/2 by 5 inches (38 by 127 mm)** with capped ends; nominal sheet thickness minimum **0.0598 inch (1.52 mm)**.
 3. Rungs: Minimum **1-3/8-inch- (35-mm-)** diameter, round rungs made from **[hardwood][maple]** firmly fixed to side rails to prevent rotating or other movement. Provide equipment with top rung extended **6 inches (152 mm)** beyond other rungs.
 4. Extended Top Rail: Provide equipment with an extension arm on side rails and an additional rung extended **[20 inches (500 mm)]<Insert dimension>** beyond lower rungs.
 5. Number of Sections: **[As indicated on Drawings]<Insert number>**, complete with intermediate uprights and terminal uprights without rung holes at finished ends.
- F. Horizontal Ladder: Wall mounted, with 12 rungs.
1. Size: **[12 feet (3.7 m) long by minimum 16 inches (400 mm) wide][As indicated on Drawings]<Insert dimension(s)>**.
 2. Side Rails: Steel tubing minimum **1-1/2 by 4 inches (38 by 102 mm)** with capped ends; tubing wall thickness minimum **0.083 inch (2.1 mm)**.
 3. Rungs: Minimum **1-5/16-inch- (33-mm-)** diameter round rungs made from **[hardwood][maple]** firmly fixed to side rails to prevent rotating or other movement.
 4. Support Frame: Minimum **1-5/16-inch- (33-mm-)** OD, steel pipe or tubing, with bracing.
 5. Ladder Installation Height and Wall Clearance: Height **[as indicated on Drawings]<Insert dimension>** and **30 inches (760 mm)** from wall.
- G. Vertical Arm Ladder: Wall mounted, with five to seven horizontal rungs for hand and foot holds.
1. Size: **[60 inches (1520 mm) long by minimum 22 inches (560 mm) wide][As indicated on Drawings]<Insert dimension(s)>**.
 2. Side Rails: Minimum **1-5/16-inch- (33-mm-)** OD, round pipe or tubing, with rails sloped 10

- degrees from wall for climbing.
 3. Rungs: Minimum **1-1/16-inch- (27-mm-)** OD, round pipe or tubing rungs firmly welded to side rails.
 4. Ladder Installation Height: **[As indicated on Drawings]<Insert dimension>**.
 5. Ladder Installation Method: **[Fixed to wall][Removable]**.
- H. Pegged Board Vertical Climber: Wall-mounted board; size as indicated on Drawings; with **[two]<Insert number>** peg handholds per board.
- I. Climbing Rope: **1-1/2-inch- (38-mm-)** diameter rope, with top end securely clamped in fitting designed for attaching to supporting structure indicated on Drawings.
1. Description: **[Three-strand hemp][Synthetic polyfiber][Manufacturer's standard material]**.
 2. Length: **[12 feet (3.7 m)][16 feet (4.9 m)][20 feet (6.1 m)][24 feet (7.3 m)][As required to allow 42 inches (1070 mm) of rope to lie on floor][As indicated on Drawings]<Insert requirement>**.
 3. Rope Bottom End: **[Tied in a Turk's head knot][Tied in a Turk's head knot and fitted with leather sheath][Fitted with heat-shrink-type PVC tube and coated with PVC coating after fitting][Manufacturer's standard]**.
 4. Rubber Balls: Securely fastened every **[12 inches (305 mm)][18 inches (460 mm)]** along length of rope.
 5. Tambourine: **24-inch (610-mm)** diameter; minimum **1/2-inch- (13-mm-)** thick, painted plywood disk for restricting climbing and for exercise competition.
 6. Safety Guard: **3/16-inch (5-mm-)** chain or **1/8-inch- (3-mm-)** diameter cable, clamp, and fittings designed for attaching guard to supporting structure indicated on Drawings.
 7. Pipe Beam: **[Ceiling][Wall and ceiling]** mounted; minimum **3-1/2-inch- (89-mm-)** OD steel pipe or tubing beam with minimum **2-3/8-inch- (60-mm-)** OD drop pipes, bracing, and connectors, designed for transferring load and securely attaching to supporting structure indicated on Drawings.
- J. Rope Hoist: Wall attached; consisting of #10 bell cord or **1/4-inch- (6-mm-)** diameter, synthetic polyfiber rope, snap swivel fitting, rope adjuster, rope weight, weight bag, pulley, rope cleat, clear-finished wood wall equipment pads for pulley and cleat attachment, clamps, and fasteners.
- K. Metal Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.
- L. Wood Finish: Manufacturer's standard transparent or opaque-painted finish.

2.6 SAFETY PADS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[AALCO Manufacturing]**
 2. **[ADP Lemco]**
 3. **[American Athletic, Inc]**
 4. **[Bison, Inc.]**
 5. **[Douglas Industries, Inc.]**
 6. **[Draper, Inc.]**
 7. **[IPI by Bison]**
 8. **[Jaypro Sports, LLC]**
 9. **[Performance Sports Systems]**
 10. **[Porter Athletic Equipment Company]**
 11. **[Schelde Sports]**

12. [Spalding]
 13. [Sports Imports, Inc.]
 14. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [AALCO Manufacturing]
 2. [ADP Lemco]
 3. [American Athletic, Inc]
 4. [Bison, Inc.]
 5. [Douglas Industries, Inc.]
 6. [Draper, Inc.]
 7. [IPI by Bison]
 8. [Jaypro Sports, LLC]
 9. [Performance Sports Systems]
 10. [Porter Athletic Equipment Company]
 11. [Schelde Sports]
 12. [Spalding]
 13. [Sports Imports, Inc.]
 14. <Insert manufacturer's name>
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: [25]<Insert value> or less.
 2. Smoke-Developed Index: [50][450]<Insert value> or less.
- E. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, minimum **14-oz./sq. yd. (475-g/sq. m)** and treated with fungicide for mildew resistance; with surface-burning characteristics indicated[, **and lined with fire-retardant liner**].
- F. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board, with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
1. Backer Board: Minimum **3/8-inch- (9.5-mm-)** thick [**plywood, mat formed, or composite panel**][**fire-retardant-treated plywood by pressure process according to AWWA U1, Use Category UCFA Fire Retardant Interior**].
 2. Fill: Multiple-impact-resistant foam, minimum [**1-1/2-inch- (38-mm-) thick polyurethane, 3.5-lb/cu. ft. (56-kg/cu. m) density**][**2-inch- (50-mm-) thick polyurethane, 3.5-lb/cu. ft. (56-kg/cu. m) density**][**1-1/2-inch- (38-mm-) thick bonded polyurethane, 6.0-lb/cu. ft. (96-kg/cu. m) density**][**2-inch- (50-mm-) thick bonded polyurethane, 6.0-lb/cu. ft. (96-kg/cu. m) density**][**1-1/4-inch- (32-mm-) thick, closed-cell polyethylene**]<Insert material, thickness, and density>.
 3. Fire-Resistive Fill: Multiple-impact-resistant foam minimum [**1-1/2-inch- (38-mm-) thick, fire-resistive neoprene, 6.0-lb/cu. ft. (96-kg/cu. m) density**][**2-inch- (50-mm-) thick, fire-resistive neoprene, 6.0-lb/cu. ft. (96-kg/cu. m) density**].
 4. Size: Each panel section [**24 inches (610 mm) wide by minimum 60 inches (1520 mm) long**][**24 inches (610 mm) wide by minimum 72 inches (1830 mm) long**][of manufacturer's standard dimensions][as indicated on Drawings]<Insert dimension(s)>.
 5. Number of Modular Panel Sections: [**As indicated on Drawings**]<Insert number>.

6. Installation Method: **[Concealed mounting Z-clips][Concealed mounting Z-clips and 1-inch (25-mm) bottom fabric attachment flange with exposed fasteners][1-inch (25-mm) top and bottom fabric attachment flange with exposed fasteners][Manufacturer's standard]<Insert requirement>.**
 7. Fabric Covering Color(s): **[Match school colors][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]** for **[one][two]<Insert number>** color(s).
 8. Graphics: Custom graphics as indicated on Drawings.
- G. Corner Wall Safety Pads: Wall corner pad consisting of minimum **1-1/4-inch- (32-mm-)** thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with **[backer board and manufacturer's standard anchorage to wall][self-adhesive, hook-and-loop attachment to exposed face of wall]**.
1. Length: Each pad **[minimum 72 inches (1830 mm)][in manufacturer's standard length][matching length of wall safety pads][as indicated on Drawings]<Insert requirement>.**
 2. Fabric Covering Color(s): **[Match color of wall safety pads][Match school colors][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]** for **[one][two]<Insert number>** color(s).
- H. Column Safety Pads: Pads covering exposed flange of columns to height indicated, consisting of minimum **1-1/4-inch- (32-mm-)** thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with **[backer board and manufacturer's standard anchorage to column][self-adhesive, hook-and-loop attachment to exposed face of column]**.
1. Length: Each pad **[minimum 72 inches (1830 mm)][in manufacturer's standard length][matching length of wall safety pads][as indicated on Drawings]<Insert requirement>.**
 2. Fabric Covering Color(s): **[Match color of wall safety pads][Match school colors][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]** for **[one][two]<Insert number>** color(s).
- I. Round Column Safety Pads: Wraparound pads **[fully][partially]** covering exposed round column to height indicated, consisting of minimum **2-inch- (50-mm-)** thick, multiple-impact-resistant, bonded polyurethane-foam filler, **6.0-lb/cu. ft. (96-kg/cu. m)** density, covered on both sides and all edges by fabric covering with **[hook-and-loop][cord lace and grommet]** attachment to column.
1. Length: Each pad **[minimum 72 inches (1830 mm)][in manufacturer's standard length][matching length of wall safety pads][as indicated on Drawings]<Insert requirement>.**
 2. Fabric Covering Color(s): **[Match color of wall safety pads][Match school colors][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]** for **[one][two]<Insert number>** color(s).
- J. Cutout Trim: Manufacturer's standard flanged cutout trim kits for fitting pads around switches, receptacles, and other obstructions.
1. Color: **[Gray][Black]**.

2.7 MATERIALS

- A. Support Cable: **[1/4-inch- (6-mm-) diameter, 7x19][Manufacturer's standard]** galvanized-stranded-steel wire rope **[with a breaking strength of 7000 lb (3175 kg)]**. Provide fittings according to the wire

rope manufacturer's written instructions for size, number, and installation method.

- B. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy-steel chains, according to ASTM A391/A391M, with commercial-quality, **[hot-dip galvanized][or][zinc-plated]** steel connectors and hangars.
- C. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, according to ASTM A413/A413M (Grade 30 proof coil chain or higher grade recommended by gymnasium equipment manufacturer). Provide coating type, chain size, number, and installation method according to manufacturer's written instructions.
- D. Castings and Hangers: Malleable iron, according to ASTM A47/A47M; grade as required for structural loading.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- H. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- I. Composite Wood Products: Products shall be made without urea formaldehyde.
- J. Softwood Plywood: DOC PS 1, exterior.
- K. Particleboard: ANSI A208.1.
- L. Equipment-Mounting Board: Wood, **[transparent][or][neutral-color-painted]** finish; size and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- M. Anchors, Fasteners, Fittings, and Hardware: Gymnasium equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed; **tamperproof, vandal- and theft-resistant design**.
- N. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, according to ASTM C1107/C1107M, with minimum strength recommended in writing by gymnasium-equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances, operational clearances, [**accurate locations of connections to building electrical system,**] and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure, [**subgrades,**] subfloors, and footings below finished floor.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions[**and competition rules for each type of gymnasium equipment**].
- B. Install gymnasium equipment after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.
 - 1. Floor-Insert Locations: Coordinate locations with application of game lines and markers[**and core drill floor for inserts after game lines are applied**].
 - 2. Floor-Insert Elevation: Coordinate installed heights of floor inserts with installation[**and field finishing**] of finish flooring and floor-plate type.
 - 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor-Insert Setting: Clean oversized, recessed voids in concrete substrate of debris. Position each sleeve, and fill void around sleeve with grout, mixed and placed according to grout manufacturer's written instructions. Protect portion of sleeve above subfloor[**and footing**] from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- F. Connections: Connect electric operators to building electrical system.
- G. Removable Gymnasium-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable gymnasium equipment after assembled configuration is approved by [**Architect**][**Owner**], and store units in location indicated on Drawings.

3.3 INSTALLATION OF SAFETY PADS

- A. Mount with bottom edge at **[4 inches (102 mm)][dimension indicated on Drawings]<Insert dimension>** above finished floor.
- B. Cutout Trim: Limit cuts in face of padding so that cuts are securely and fully concealed behind trim-kit flange.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**:
 - 1. Perform visual inspections and operational tests as recommended by **[referenced standard rules of each sport and]** the equipment manufacturer.
 - 2. Test rebound elasticity of basketball goals.
 - 3. Test basketball goal pressure-release characteristics and adjustability.
- C. Gymnasium equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 11 66 23 00



Task	Specification	Specification Description
11 66 23 13	01 11 19 00	No Specification Required
11 66 23 13	11 66 23 00	Gymnasium Equipment
11 66 23 23	11 66 23 00	Gymnasium Equipment
11 66 23 53	11 66 23 00	Gymnasium Equipment
11 66 43 00	01 11 19 00	No Specification Required
11 66 43 00	11 66 23 00	Gymnasium Equipment



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SECTION 11 66 53 00 - GYMNASIUM DIVIDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Walk-draw divider systems.
2. Fold-up divider systems.
3. Radius-fold divider systems.
4. Peak-fold divider systems.
5. Roll-up divider systems.
6. Top-roll divider systems.
7. Center-drive divider systems.
8. Electric operators.
9. Divider curtains.
10. Divider system accessories.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For gymnasium dividers.

1. Include plans showing alignment of curtains in relation to sport-court layout and overhead structural supports.
2. Include elevations, sections, details, and attachments to other work.
3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
4. Include point loads and locations for attachment of gymnasium dividers to structure.
5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each item and color specified.

D. Samples for Initial Selection: For each type of gymnasium divider curtain fabric.

E. Samples for Verification: For divider curtain fabrics, not less than **12 inches (305 mm)** square **[of mesh][and][of solid fabric]**.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans with divider-curtain layouts, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items

involved:

1. Structural members to which divider-curtain systems will be attached.
2. Suspended ceiling components, if any.
3. Items supported from building structure, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Acoustical treatments or panels.
 - g. Access panels.
 - h. **<Insert item>**.

- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of gymnasium divider.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: **[Fabricator of products][An entity that employs installers and supervisors who are trained and approved by manufacturer]**.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of gymnasium dividers.
 - b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WALK-DRAW DIVIDER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be**

incorporated into the Work include, but are not limited to, the following]:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Douglas Industries, Inc.]
5. [Draper, Inc.]
6. [IPI by Bison]
7. [Jaypro Sports, LLC]
8. [Performance Sports Systems]
9. [Porter Athletic Equipment Company]
10. [Spalding]
11. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Douglas Industries, Inc.]
5. [Draper, Inc.]
6. [IPI by Bison]
7. [Jaypro Sports, LLC]
8. [Performance Sports Systems]
9. [Porter Athletic Equipment Company]
10. [Spalding]
11. <Insert manufacturer's name>

- C. Source Limitations: Obtain from single source from single manufacturer.

- D. Divider-Curtain System: Manually operated, [cable-suspended][channel track] system,[curved as indicated on Drawings,] and as follows:

1. Stacking: [Stacks to one side][Bi-parting with 36-inch (910-mm) overlap at opening]<Insert requirement> as indicated on Drawings.
2. Top Hem: Double-thickness mesh or solid vinyl for grommets.
3. Outer Edge Hems: [Double turned and][Triple turned and double] welded.
4. Bottom Pocket: Double thickness with proof coil chain in pocket.
5. Support Cable: [1/4-inch- (6-mm-) diameter][Manufacturer's standard] galvanized-stranded-steel wire rope[with a breaking strength of 7000 lb (3175 kg)]. Provide fittings according to the wire rope manufacturer's written instructions for size, type, number, and installation method.
6. Channel Track: Galvanized steel or formed aluminum.
7. Grommets: Manufacturer's standard material, size, and spacing; for snaps or S-hooks.

2.2 FOLD-UP DIVIDER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Draper, Inc.]

5. [IPI by Bison]
6. [Jaypro Sports, LLC]
7. [Performance Sports Systems]
8. [Porter Athletic Equipment Company]
9. [Spalding]
10. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Draper, Inc.]
5. [IPI by Bison]
6. [Jaypro Sports, LLC]
7. [Performance Sports Systems]
8. [Porter Athletic Equipment Company]
9. [Spalding]
10. <Insert manufacturer's name>

C. Source Limitations: Obtain from single source from single manufacturer.

D. Divider-Curtain System: Electrically operated, upward folding, cable suspended, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Outer Edge Hems: Triple turned[**and welded**].
3. Bottom Curtain Pocket: [6 inches (152 mm)]<Insert dimension> with manufacturer's standard pipe batten[**with padding**].
4. Grommets: Manufacturer's standard material, size, and spacing; for lift cables to pass through curtain fabric.
5. Support Cables: [1/8-inch- (3.2-mm-) diameter]<Insert dimension> galvanized-stranded-steel wire rope[**with a breaking strength of 2000 lb (907 kg)**]. Provide fittings according to cable manufacturer's written instructions for size, type, number, and installation method.
6. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
7. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens and drive pipe, or shop prime and shop finish with black paint.
 - a. Drive Pipe: **2-3/8-inch- (60-mm-)** nominal diameter steel pipe.
 - b. Top and Bottom Battens: **1-1/2-inch- (38-mm-)** nominal diameter steel pipe.

2.3 RADIUS-FOLD DIVIDER SYSTEMS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [AALCO Manufacturing]
2. [Draper, Inc.]
3. [Jaypro Sports, LLC]
4. [Performance Sports Systems]
5. [Porter Athletic Equipment Company]

6. [Spalding]
 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [AALCO Manufacturing]
 2. [Draper, Inc.]
 3. [Jaypro Sports, LLC]
 4. [Performance Sports Systems]
 5. [Porter Athletic Equipment Company]
 6. [Spalding]
 7. <Insert manufacturer's name>
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Divider-Curtain System: Electrically operated, upward folding, cable suspended, curved as indicated on Drawings, and as follows:
1. Top Hem: Double-thickness mesh or solid vinyl for pipe battens.
 2. Outer Edge Hems: Triple turned[**and welded**].
 3. Bottom Curtain Pocket: [6 inches (152 mm)]<Insert dimension> with manufacturer's standard pipe batten[**with padding**].
 4. Grommets: Manufacturer's standard material, size, and spacing; for lift cables to pass through curtain fabric.
 5. Support Cable: [1/8-inch- (3.2-mm-) diameter]<Insert dimension> galvanized-stranded-steel wire rope[**with a breaking strength of 2000 lb (907 kg)**]. Provide fittings according to cable manufacturer's written instructions for size, type, number, and installation method.
 6. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
 7. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens and drive pipe, or shop prime and shop finish with black paint.
 - a. Drive Pipe: 2-3/8-inch- (60-mm-) nominal diameter steel pipe.
 - b. Top and Bottom Battens: 1-1/2-inch- (38-mm-) nominal diameter steel pipe.
 - c. Provide segmented or universal-joint-coupled pipe and hoist system design, allowing divider to follow radius indicated.

2.4 PEAK-FOLD DIVIDER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [AALCO Manufacturing]
 2. [ADP Lemco]
 3. [Draper, Inc.]
 4. [Jaypro Sports, LLC]
 5. [Performance Sports Systems]
 6. [Porter Athletic Equipment Company]
 7. [Spalding]
 8. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's

name; product name or designation> or comparable product by one of the following:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Draper, Inc.]
4. [Jaypro Sports, LLC]
5. [Performance Sports Systems]
6. [Porter Athletic Equipment Company]
7. [Spalding]
8. <Insert manufacturer's name>

C. Source Limitations: Obtain from single source from single manufacturer.

D. Divider-Curtain System: Electrically operated, upward folding, cable suspended, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for pipe battens.
2. Outer Edge Hems: Triple turned[**and welded**].
3. Bottom Curtain Pocket: [6 inches (152 mm)]<Insert dimension> with manufacturer's standard pipe batten[**with padding**].
4. Grommets: Manufacturer's standard material, size, and spacing; for lift cables to pass through curtain fabric.
5. Support Cable: [1/8-inch- (3.2-mm-) diameter][1/4-inch- (6-mm-) diameter][**Manufacturer's standard**] galvanized-stranded-steel wire rope[**with a breaking strength of 2000 lb (907 kg)**]. Provide fittings according to cable manufacturer's written instructions for size, type, number, and installation method.
6. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
7. Curtain Battens: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens, or shop prime and shop finish with black paint.
 - a. Top and Bottom Battens: 1-1/2-inch- (38-mm-) nominal diameter steel pipe.
8. Provide drums of varying diameters to evenly retract curtains to sloped ceiling[, **and hinged piping to fit to changes in ceiling slope**]. Provide sheave assemblies or idler pulleys to guide cables, and other system components required to follow ceiling contour.

2.5 ROLL-UP DIVIDER SYSTEMS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [ADP Lemco]
2. [Arizona Courtlines, Inc.]
3. [Draper, Inc.]
4. [IPI by Bison]
5. [Jaypro Sports, LLC]
6. [Performance Sports Systems]
7. [Porter Athletic Equipment Company]
8. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [ADP Lemco]
2. [Arizona Courtlines, Inc.]
3. [Draper, Inc.]
4. [IPI by Bison]
5. [Jaypro Sports, LLC]
6. [Performance Sports Systems]
7. [Porter Athletic Equipment Company]
8. <Insert manufacturer's name>

C. Source Limitations: Obtain from single source from single manufacturer.

D. Divider-Curtain System: Electrically operated with roll-up drive pipe, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Outer Edge Hems: Double turned[**and welded**].
3. Belts: [4-inch- (102-mm-) wide][5-inch- (127-mm-) wide][**Manufacturer's standard width**] polyester or polyurethane webbing or fabric belts, attached to top batten, passing under bottom batten and terminating at drive pipe, with friction surface on one side of belt or other means of drawing up curtain by rolling at bottom batten.
4. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
5. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens, or shop prime and shop finish with black paint.
 - a. Drive Pipe: **2-3/8-inch- (60-mm-)** nominal diameter steel pipe.
 - b. Top Batten: **1-1/2-inch- (38-mm-)** nominal diameter steel pipe.
 - c. Bottom Batten: **3-1/2-inch- (89-mm-)** nominal diameter steel pipe.

2.6 TOP-ROLL DIVIDER SYSTEMS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Draper, Inc.]
5. [IPI by Bison]
6. [Jaypro Sports, LLC]
7. [Performance Sports Systems]
8. [Spalding]
9. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [AALCO Manufacturing]
2. [ADP Lemco]
3. [Arizona Courtlines, Inc.]
4. [Draper, Inc.]
5. [IPI by Bison]
6. [Jaypro Sports, LLC]
7. [Performance Sports Systems]

8. [Spalding]
9. <Insert manufacturer's name>

C. Source Limitations: Obtain from single source from single manufacturer.

D. Divider-Curtain System: Electrically operated, top-roll drive pipe, and as follows:

1. Outer Edge Hems: Double turned[**and welded**].
2. Supports and Fittings: Corrosion-resistant steel clamps and hangers.
3. Drive Pipe: **3-1/8-inch (79-mm)** nominal diameter, fabricated from steel, aluminum, or PVC pipe or tubing, with a minimum number of joints as necessary for required lengths. Steel shall be galvanized or shop primed and shop finished with black paint.
4. Curtain Battens: **1-1/2-inch (38-mm)** nominal diameter, fabricated from steel pipe or tubing, with a minimum number of joints as necessary for required lengths. Provide galvanized steel, or shop prime and shop finish with black paint.

2.7 CENTER-DRIVE DIVIDER SYSTEMS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [ADP Lemco]
2. [Performance Sports Systems]
3. [Porter Athletic Equipment Company]
4. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [ADP Lemco]
2. [Performance Sports Systems]
3. [Porter Athletic Equipment Company]
4. <Insert manufacturer's name>

C. Source Limitations: Obtain from single source from single manufacturer.

D. Divider-Curtain System: Electrically operated, with center-drive tube rolling the upper and lower sections of the curtain simultaneously; and as follows:

1. Adjustable pipe hanger assembly.
2. Roll Tube: Anodized, extruded-aluminum tubing.

2.8 ELECTRIC OPERATORS

A. Provide factory-assembled electric operation system of size and capacity recommended in writing and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors and factory-prewired motor controls, control devices, and accessories required for proper operation.

1. Include wiring from control stations to motors and between synchronizer and dual motors for long curtains. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

- B. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Motor Electrical Characteristics:
 - 1. Horsepower: [3/4][1]<Insert number> hp.
 - 2. Voltage: [115 V ac]<Insert requirement>, single phase, 60 hertz.
- D. Limit Switches: Adjustable switches at each divider curtain, interlocked with motor controls and set to automatically stop divider curtain at fully extended and fully retracted positions.
- E. Control System:
 - 1. Key-Switch Operation: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control with up, down, and off functions.
 - a. Group Key-Switch Control: One switch per [each curtain]<Insert requirement>.
 - b. Switches, Ganged: Single faceplate with multiple switch cutouts [for two switches][for three switches][as indicated on Drawings]<Insert requirement>.
 - c. Keys: Provide [one][two] key(s) per station.
 - 2. Radio control system.
 - 3. Keypad control system.
 - 4. Wireless control system.
 - 5. Touch-screen programmable operating system.

2.9 DIVIDER CURTAINS

- A. Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than [7 oz./sq. yd. (237 g/sq. m)][9 oz./sq. yd. (305 g/sq. m)][13 oz./sq. yd. (440 g/sq. m)]<Insert value>.
 - 1. Mesh Color: [Gray][Black][White][Blue][Red][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
- B. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than [7 oz./sq. yd. (237 g/sq. m)][9 oz./sq. yd. (305 g/sq. m)][13 oz./sq. yd. (440 g/sq. m)]<Insert value>.
 - 1. Mesh Color: [Gray][Black][White][Blue][Red][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
- C. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, [18 oz./sq. yd. (610 g/sq. m)][22 oz./sq. yd. (745 g/sq. m)]<Insert value>, [8-foot (2.4-m)][10-foot (3.0-m)]<Insert dimension> height above floor.
 - 1. Fabric Color(s): [One][Two]<Insert number> color(s), [matching school colors][as indicated by manufacturer's designations][match Architect's sample][as selected by Architect from full range of industry colors and color densities]<Insert color(s)>.
- D. Hems: Folded and electronically welded.
- E. Seams: Electronically welded.
- F. Overall Curtain Height: [Floor to ceiling, within installation clearances required][As indicated on Drawings].

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- G. Bottom of Curtain: Approximately **2 inches (50 mm)** above finished floor.
- H. Divider-Curtain Flame-Resistance Rating: [**Passes NFPA 701 Test 2**]**<Insert requirement for fire-test-response characteristic>**.

2.10 DIVIDER SYSTEM ACCESSORIES

- A. Safety Lock: Locks drive system when speed exceeds [**1-1/2 fps (0.3 m/s)**]**[manufacturer's recommended speed]<Insert requirement>**.
- B. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

2.11 SUPPORT MATERIALS AND FASTENERS

- A. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80, heat-treated alloy-steel chains, according to ASTM A391/A391M, with commercial-quality, [**hot-dip galvanized**]**[or][zinc-plated]** steel connectors and hangers.
- B. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, according to ASTM A413/A413M, Grade 30 proof coil chain or higher grade recommended by gymnasium divider manufacturer. Provide coating type, chain size, number, and installation method according to manufacturer's written instructions.
- C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed[; **tamperproof, vandal-resistant design**].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, [**locations of connections to building electrical system,**] and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Install gymnasium dividers after other finishing operations, including painting, have been completed unless otherwise indicated.

- C. Install gymnasium dividers level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with sport-court layout.
 - 1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Electric Operators Installation: Connect electric operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.
- B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION 11 66 53 00



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Task	Specification	Specification Description
11 66 53 11	11 66 53 00	Gymnasium Dividers



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SECTION 11 68 00 00 - PLAY FIELD EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes playground equipment as follows:

1. Freestanding playground equipment.
2. Composite playground equipment.

1.2 DEFINITIONS

- A. Definitions in ASTM F1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- C. Shop Drawings: For each type of playground equipment.
1. Include plans, elevations, sections, and attachment details.
 2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."
- D. Samples for Initial Selection: For each type of exposed finish.
1. Manufacturer's color charts.
 2. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish on the following products:
1. Include Samples of accessories to verify color and finish selection.
 2. Posts and Rails: Minimum **6 inches (150 mm)** long.
 3. Platforms: Minimum **6 inches (150 mm)** square.
 4. Molded Plastic: Minimum **3 inches (76 mm)** square.

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1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][manufacturer][and][testing agency].
- B. Product Certificates: For each type of playground equipment.
- C. Material Certificates: For the following items:
 - 1. Shop finishes.
 - 2. Wood-Preservative Treatment: Include certification by treating plant that states type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
- D. Field quality-control reports.
- E. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- F. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: **[Two][Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain playground equipment from single source from single manufacturer.
- B. Playground equipment and components shall have the IPEMA Certification Seal.
- C. The following playground equipment and components shall have the IPEMA Certification Seal:
 1. **<Insert playground equipment or component>**.

2.2 PERFORMANCE REQUIREMENTS

- A. Safety Standard: Provide playground equipment according to **[ASTM F1487]<Insert requirements>**.

2.3 FREESTANDING PLAYGROUND EQUIPMENT

- A. Swing Set : **[Traditional style with tripod angled legs][Contemporary style with vertical bipod arches][Contemporary style with single-post legs][Contemporary T-style]<Insert style>** providing upright support.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Swing Products Inc.]**
 - b. **[BCI Burke Company, LLC]**
 - c. **[Big Toys, Inc.; a PlayCore, Inc., company]**
 - d. **[Blue Imp Recreational Products of Canada]**
 - e. **[Columbia Cascade Company]**
 - f. **[GameTime; a PlayCore Company]**
 - g. **[Henderson Recreation Equipment Ltd]**
 - h. **[Kidstuff Playsystems, Inc.]**
 - i. **[Kompan, Inc]**
 - j. **[Krauss Craft, Inc.]**
 - k. **[L.A. Steelcraft, a brand of Americana Outdoor]**
 - l. **[Landscape Structures Inc.]**
 - m. **[Little Tikes Company U.S. (The); PlayPower Inc.]**
 - n. **[Miracle Recreation Equipment Company]**
 - o. **[Play & Park Structures; a PlayCore, Inc., company]**
 - p. **[Playland; a division of Superior International Industries]**
 - q. **[SportsPlay Equipment, Inc]**
 - r. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [American Swing Products Inc.]
 - b. [BCI Burke Company, LLC]
 - c. [Big Toys, Inc.; a PlayCore, Inc., company]
 - d. [Blue Imp Recreational Products of Canada]
 - e. [Columbia Cascade Company]
 - f. [GameTime; a PlayCore Company]
 - g. [Henderson Recreation Equipment Ltd]
 - h. [Kidstuff Playsystems, Inc.]
 - i. [Kompan, Inc]
 - j. [Krauss Craft, Inc.]
 - k. [L.A. Steelcraft, a brand of Americana Outdoor]
 - l. [Landscape Structures Inc.]
 - m. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - n. [Miracle Recreation Equipment Company]
 - o. [Play & Park Structures; a PlayCore, Inc., company]
 - p. [Playland; a division of Superior International Industries]
 - q. [SportsPlay Equipment, Inc]
 - r. <Insert manufacturer's name>
3. Metal Frame: [Galvanized-steel][Aluminum] pipe or tubing.
- a. Leg Upright(s): Not less than [1-7/8-inch (48-mm)][2-3/8-inch (60-mm)][3-1/2-inch (89-mm)][4-1/2-inch (114-mm)][5-inch (127-mm)]<Insert dimension> OD.
 - b. Overhead Beam: [Match leg upright][Not less than 2-3/8-inch (60-mm)][Not less than 3-1/2-inch (89-mm)]<Insert dimension> OD.
 - c. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
4. Wood Frame: Leg upright(s) and overhead beam not less than [4 inches (102 mm) square][6 inches (150 mm) square][6 inches (150 mm) round]<Insert dimension> or larger.
5. Overhead Beam Height: [96 inches (2440 mm)][10 ft. (3 m)][Height as indicated on Drawings]<Insert dimension> from pivot point to protective surfacing below.
6. Suspension Members: [Standard link chain][Short link chain not permitting finger penetration][Cable][Manufacturer's standard].
- a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
7. Swing Connector: [S-hook][Double clevis and bolt link].
8. Swing Hanger: Galvanized [stamped steel clamp and ductile-iron pivot][heavy-duty ductile iron][manufacturer's standard].
9. Swing Seats: [Enclosed, full-bucket infant/tot][Half-bucket][U-shaped flexible belt][Rigid rectangular][Rigid disk][Tire]<Insert style> seat made from [rubber][plastic]<Insert material>.
- a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
10. Capacity: [One][Two][Three]<Insert number> swing(s).
11. Age Appropriateness: [Two through five years][Five through 12 years]<Insert age group>.
- B. Slide : [Single][Double-side-by-side][Double-diverging]<Insert description> descending chute(s), traditional style].
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Swing Products Inc.]
 - b. [BCI Burke Company, LLC]
 - c. [Big Toys, Inc.; a PlayCore, Inc., company]
 - d. [Blue Imp Recreational Products of Canada]
 - e. [Columbia Cascade Company]
 - f. [GameTime; a PlayCore Company]
 - g. [Henderson Recreation Equipment Ltd]
 - h. [Kidstuff Playsystems, Inc.]
 - i. [Kompan, Inc]
 - j. [Krauss Craft, Inc.]
 - k. [L.A. Steelcraft, a brand of Americana Outdoor]
 - l. [Landscape Structures Inc.]
 - m. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - n. [Miracle Recreation Equipment Company]
 - o. [Play & Park Structures; a PlayCore, Inc., company]
 - p. [Playland; a division of Superior International Industries]
 - q. [SportsPlay Equipment, Inc]
 - r. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [American Swing Products Inc.]
 - b. [BCI Burke Company, LLC]
 - c. [Big Toys, Inc.; a PlayCore, Inc., company]
 - d. [Blue Imp Recreational Products of Canada]
 - e. [Columbia Cascade Company]
 - f. [GameTime; a PlayCore Company]
 - g. [Henderson Recreation Equipment Ltd]
 - h. [Kidstuff Playsystems, Inc.]
 - i. [Kompan, Inc]
 - j. [Krauss Craft, Inc.]
 - k. [L.A. Steelcraft, a brand of Americana Outdoor]
 - l. [Landscape Structures Inc.]
 - m. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - n. [Miracle Recreation Equipment Company]
 - o. [Play & Park Structures; a PlayCore, Inc., company]
 - p. [Playland; a division of Superior International Industries]
 - q. [SportsPlay Equipment, Inc]
 - r. <Insert manufacturer's name>
3. Plan Configuration: [Straight-aligned][Quarter-turn][Half-turn][Three-quarter-turn][Full-turn spiral][S-shaped]<Insert description> chute(s).
4. Access: [Stair or stepladder with handrails][Vertical ladder][Vertical ladder with side handrails].
5. Sit-Down Entrance: With [protective barriers][opaque plastic panel barriers][canopy or hood enclosure] and overhead [handhold][and side handholds].
6. Frame: Manufacturer's standard [galvanized-steel pipe or tubing][aluminum pipe or tubing][wood]<Insert material>.
7. Sliding Surface: [Inclined][Wavy][Washboard rollers].
8. Sliding Surface Construction: [Flat, continuous stainless-steel sheet with integral, full-length side rails][U-shaped, continuous stainless-steel sheet with integral, full-length side



rails][One-piece plastic with integral, full-length side rails][Plastic tube, ID not less than 24 inches (610 mm)][Plastic tube, ID not less than 30 inches (760 mm)]<Insert description>.

9. Colors: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
10. Age Appropriateness: [Two through five years][Five through 12 years]<Insert age group>.

C. Tunnel (Crawl Tube) : Freestanding, [straight-aligned][quarter-turn][half-turn][S-shaped][zigzag][wavy][inclined]<Insert description> configuration.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [Landscape Structures Inc.]
 - k. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - l. [Miracle Recreation Equipment Company]
 - m. [Play & Park Structures; a PlayCore, Inc., company]
 - n. [Playland; a division of Superior International Industries]
 - o. [Playworld Systems, Inc.]
 - p. [SportsPlay Equipment, Inc]
 - q. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [Landscape Structures Inc.]
 - k. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - l. [Miracle Recreation Equipment Company]
 - m. [Play & Park Structures; a PlayCore, Inc., company]
 - n. [Playland; a division of Superior International Industries]
 - o. [Playworld Systems, Inc.]
 - p. [SportsPlay Equipment, Inc]
 - q. <Insert manufacturer's name>
3. Material: [Plastic tube, ID not less than 24 inches (610 mm)][Plastic tube, ID not less than 30

- inches (760 mm)]<Insert description>.
4. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
- D. Climber : [Arch][Tower][Dome][Overhead horizontal ladder][Overhead pole][Flexible cable net][Flexible chain net][Vertical ladder][Vertical panel wall]<Insert description>.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [L.A. Steelcraft, a brand of Americana Outdoor]
 - k. [Landscape Structures Inc.]
 - l. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - m. [Miracle Recreation Equipment Company]
 - n. [Play & Park Structures; a PlayCore, Inc., company]
 - o. [Playland; a division of Superior International Industries]
 - p. [Playworld Systems, Inc.]
 - q. [SportsPlay Equipment, Inc]
 - r. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [L.A. Steelcraft, a brand of Americana Outdoor]
 - k. [Landscape Structures Inc.]
 - l. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - m. [Miracle Recreation Equipment Company]
 - n. [Play & Park Structures; a PlayCore, Inc., company]
 - o. [Playland; a division of Superior International Industries]
 - p. [Playworld Systems, Inc.]
 - q. [SportsPlay Equipment, Inc]
 - r. <Insert manufacturer's name>
 3. Frame: Manufacturer's standard [galvanized-steel pipe or tubing][aluminum pipe or tubing][wood]<Insert material>.

4. Accessories:
 - a. Sliding Pole(s): [One][Two][Three][Four].
 - b. Handhold rings.
 5. Colors: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
 6. Capacity: [Five][10]<Insert number> users.
 7. Age Appropriateness: [Two through five years][Five through 12 years]<Insert age group>.
- E. Merry-Go-Round or Whirl : Rotating [platform][seating][hang bars] around a vertical axis.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [Landscape Structures Inc.]
 - k. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - l. [Miracle Recreation Equipment Company]
 - m. [Play & Park Structures; a PlayCore, Inc., company]
 - n. [Playland; a division of Superior International Industries]
 - o. [SportsPlay Equipment, Inc]
 - p. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [BCI Burke Company, LLC]
 - b. [Big Toys, Inc.; a PlayCore, Inc., company]
 - c. [Blue Imp Recreational Products of Canada]
 - d. [Columbia Cascade Company]
 - e. [GameTime; a PlayCore Company]
 - f. [Henderson Recreation Equipment Ltd]
 - g. [Kidstuff Playsystems, Inc.]
 - h. [Kompan, Inc]
 - i. [Krauss Craft, Inc.]
 - j. [Landscape Structures Inc.]
 - k. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - l. [Miracle Recreation Equipment Company]
 - m. [Play & Park Structures; a PlayCore, Inc., company]
 - n. [Playland; a division of Superior International Industries]
 - o. [SportsPlay Equipment, Inc]
 - p. <Insert manufacturer's name>

3. Rotating Mechanism: Permanently sealed and lubricated ball bearings with **[hydraulic][or][mechanical]** speed-limiting device.
 4. Platform: Round, **[dish-shaped][flat][flat, dimpled]** steel sheet, not less than **0.12-inch- (3.0-mm-)** nominal thickness, with slip-resistant footing.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]**.
 5. Handholds and Handrails: Metal pipe or tubing.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]**.
 6. Capacity: **[Single][Two][Five]<Insert number>** user(s).
 7. Age Appropriateness: **[Two through five years][5 through 12 years]<Insert age group>**.
- F. Rocking/Springing Equipment : **[Rocking rider][Rocking platform][Seesaw]<Insert description>**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Swing Products Inc.]**
 - b. **[BCI Burke Company, LLC]**
 - c. **[Big Toys, Inc.; a PlayCore, Inc., company]**
 - d. **[Blue Imp Recreational Products of Canada]**
 - e. **[Columbia Cascade Company]**
 - f. **[GameTime; a PlayCore Company]**
 - g. **[Henderson Recreation Equipment Ltd]**
 - h. **[Kidstuff Playsystems, Inc.]**
 - i. **[Kompan, Inc]**
 - j. **[Krauss Craft, Inc.]**
 - k. **[L.A. Steelcraft, a brand of Americana Outdoor]**
 - l. **[Landscape Structures Inc.]**
 - m. **[Little Tikes Company U.S. (The); PlayPower Inc.]**
 - n. **[Miracle Recreation Equipment Company]**
 - o. **[Play & Park Structures; a PlayCore, Inc., company]**
 - p. **[Playland; a division of Superior International Industries]**
 - q. **[Playworld Systems, Inc.]**
 - r. **[SportsPlay Equipment, Inc]**
 - s. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Swing Products Inc.]**
 - b. **[BCI Burke Company, LLC]**
 - c. **[Big Toys, Inc.; a PlayCore, Inc., company]**
 - d. **[Blue Imp Recreational Products of Canada]**
 - e. **[Columbia Cascade Company]**
 - f. **[GameTime; a PlayCore Company]**
 - g. **[Henderson Recreation Equipment Ltd]**
 - h. **[Kidstuff Playsystems, Inc.]**
 - i. **[Kompan, Inc]**

- j. [Krauss Craft, Inc.]
 - k. [L.A. Steelcraft, a brand of Americana Outdoor]
 - l. [Landscape Structures Inc.]
 - m. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - n. [Miracle Recreation Equipment Company]
 - o. [Play & Park Structures; a PlayCore, Inc., company]
 - p. [Playland; a division of Superior International Industries]
 - q. [Playworld Systems, Inc.]
 - r. [SportsPlay Equipment, Inc]
 - s. <Insert manufacturer's name>
3. Seat(s): [Cast aluminum][Molded plastic][or][Wood]<Insert material>; with handholds[; with handholds and footrests].
- a. Seat Style: [Animal][Automobile]<Insert type of animal or vehicle, or other description>.
 - b. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
4. Multiple Seating and Standing Platform: [Manufacturer's standard platform with slip-resistant finish]<Insert description>.
- a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
5. Frame: [Galvanized-steel pipe or tubing][Aluminum pipe or tubing][or][wood] and [one][or][two]<Insert number> coil spring(s); two or more steel springs with steel base plate.
- a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
6. Capacity: [Single][Two]<Insert number> user(s).
7. Age Appropriateness: [Two through five years][Five through 12 years]<Insert age group>.

2.4 COMPOSITE PLAYGROUND EQUIPMENT

- A. Composite Play Structure : Integral play assembly that provides more than one play activity; manufactured as a system or assembled from manufacturer's standard modular-sized units.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Swing Products Inc.]
 - b. [BCI Burke Company, LLC]
 - c. [Big Toys, Inc.; a PlayCore, Inc., company]
 - d. [Blue Imp Recreational Products of Canada]
 - e. [Columbia Cascade Company]
 - f. [GameTime; a PlayCore Company]
 - g. [Henderson Recreation Equipment Ltd]
 - h. [Kidstuff Playsystems, Inc.]
 - i. [Kompan, Inc]
 - j. [Krauss Craft, Inc.]

- k. [Landscape Structures Inc.]
 - l. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - m. [Miracle Recreation Equipment Company]
 - n. [Play & Park Structures; a PlayCore, Inc., company]
 - o. [Playland; a division of Superior International Industries]
 - p. [PlayTown; a brand of SportsPlay Equipment Inc.]
 - q. [Playworld Systems, Inc.]
 - r. [SportsPlay Equipment, Inc]
 - s. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Swing Products Inc.]
 - b. [BCI Burke Company, LLC]
 - c. [Big Toys, Inc.; a PlayCore, Inc., company]
 - d. [Blue Imp Recreational Products of Canada]
 - e. [Columbia Cascade Company]
 - f. [GameTime; a PlayCore Company]
 - g. [Henderson Recreation Equipment Ltd]
 - h. [Kidstuff Playsystems, Inc.]
 - i. [Kompan, Inc]
 - j. [Krauss Craft, Inc.]
 - k. [Landscape Structures Inc.]
 - l. [Little Tikes Company U.S. (The); PlayPower Inc.]
 - m. [Miracle Recreation Equipment Company]
 - n. [Play & Park Structures; a PlayCore, Inc., company]
 - o. [Playland; a division of Superior International Industries]
 - p. [PlayTown; a brand of SportsPlay Equipment Inc.]
 - q. [Playworld Systems, Inc.]
 - r. [SportsPlay Equipment, Inc]
 - s. <Insert manufacturer's name>
3. Metal Frame: [Galvanized-steel][Aluminum] pipe or tubing connected with [bolts][or][clamps].
 - a. Main Frame Posts: Not less than [4-inch (102-mm)][5-inch (127-mm)][6-inch (150-mm)]<Insert dimension> OD.
 - b. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
4. Wood Frame: Frame components connected with bolts.
 - a. Main Frame Posts: Not less than [4 inches (102 mm) square][6 inches (150 mm) square][6 inches (150 mm) round]<Insert dimension>.
 - b. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
5. Platforms: [Perforated metal][Wood][Plastic][Manufacturer's standard]<Insert material>.
 - a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
6. Roofs: [Perforated metal][Plastic][Wood][Manufacturer's standard]<Insert material>.
 - a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As

selected by Architect from manufacturer's full range].

7. Play Structure Access Component(s): [Ladder][Stepladder][Stairs][Ramp][Accessible crawl ramp][Accessible transfer platform]<Insert description>.
 - a. Handholds: [Protective barriers][Guardrails][Handrails][Handholds][on each side].
8. Equipment: Include the following play event components:
 - a. Activity panel.
 - b. Balance beam.
 - c. Bridge.
 - d. Climber: [Overhead horizontal ladder][Vertical ladder][Flexible net][Panel][Pole].
 - e. Log roll.
 - f. Slide.
 - g. Track ride.
 - h. Tunnel.
 - i. Colors: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
9. Arrangement: [As indicated on Drawings][Manufacturer's standard].
10. Capacity: [10][20]<Insert number> users.
11. Age Appropriateness: [Two through five years][Five through 12 years]<Insert age group>.

2.5 FABRICATION

- A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structures, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required for equipment indicated.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as required. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- C. Wood Frame: Fabricate main-frame upright support posts from wood. Fabricate secondary frame members, bracing, and connections from wood, steel, or aluminum.
- D. Composite Frame: Fabricate main-frame upright support posts from metal and plastic. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- E. Play Surfaces: Manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from [perforated or expanded metal][molded plastic][plastic panel or plank][polyethylene panel or plank][wood plank]<Insert construction> made into floor units with slip-resistant finish. Fabricate units in modular sizes and shapes to form assembled play surfaces indicated.
- F. Protective Barriers: Fabricate according to [ASTM F1487]<Insert requirement>. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from[one or more of] the following:

1. Welded-metal pipe or tubing with vertical bars.
 2. Steel sheet with openings for vision and ventilation.
 3. Metal-pipe or -tubing frame with wire-mesh infill panels.
 4. **[Opaque][Transparent]** plastic panels **[with openings]**.
 5. Vertical wood balusters with metal pipe or tubing or wood frame.
 6. Wood panels with openings for vision and ventilation.
- G. Guardrails: Provide guardrails configured to completely surround the protected area, except for access openings. Fabricate from **[welded metal pipe or tubing][metal pipe or tubing, and wood]<Insert construction>**. Extend guardrails according to requirements for use by age group indicated.
- H. Handrails: Welded metal pipe or tubing, maximum OD **[between 0.95 and 1.55 inches (24 and 39 mm)][of 0.125 inch (3.2 mm)]**.
1. Provide handrails at heights to comply with requirements for use by age group indicated according to **[ASTM F1487]<Insert requirement>**.
- I. Roofs and Canopies: Designed to discourage and minimize climbing by users.
1. Fabricated from **[metal][metal-pipe or -tubing-framed welded wire][opaque plastic][clear polycarbonate plastic][polyethylene][or][wood]<Insert construction>**.
- J. Signs: Manufacturer's standard sign panels, fabricated from **[opaque plastic with graphics molded in][wood with painted graphics]<Insert description>**, attached **[to freestanding, upright support posts][or][directly to playground equipment]<Insert requirement>**.
1. Text: **[Minimum informational content according to ASTM F1487]<Insert content>**.
 2. Colors: **<Insert colors or manufacturer's designation>**.

2.6 MATERIALS

- A. Aluminum: Material, alloy, and temper recommended by manufacturer for type of use and finish indicated.
- B. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated **[, hot-dip galvanized]**.
- C. Stainless-Steel Sheet: Type 304; finished on exposed faces with No. 2B finish.
- D. Wood: **[Douglas fir, preservative treated after fabrication][Pine, preservative treated after fabrication][Western red cedar]<Insert species and treatment>**, surfaced smooth on all sides and all edges rounded.
- E. Certified Wood: Wood products shall be certified as "FSC Pure" **[or "FSC Mixed Credit"]** according to FSC STD-01-001 and FSC STD-40-004.
- F. Certified Wood: Wood products shall be certified as "FSC Pure" **[or "FSC Mixed Credit"]** according to FSC STD-01-001 and FSC STD-40-004.
- G. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.

- H. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- I. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- J. Plywood: PS 1, Exterior grade; smooth surfaced with rounded edges; **preservative treated after fabrication**.
- K. Opaque Plastics: Color impregnated, UV stabilized, and mold resistant.
- L. Transparent Plastic: Abrasion-resistant, UV-stabilized polycarbonate sheet; **[clear, colorless]<Insert color tint>**; not less than **3/16 inch (5 mm)** thick.
- M. Suspension Chain and Fittings: ASTM A467/A467M, Class CS, 4/0 or 5/0, welded-straight-link coil chain; **[hot-dip galvanized][zinc plated][or][PVC coated]**; with commercial-quality, **[hot-dip galvanized][or][zinc-plated]** steel connectors and swing or ring hangers.
- N. Suspension Cable: Manufacturer's standard **[hot-dip galvanized][zinc-plated][or][PVC-coated]** cable; with commercial-quality, **[hot-dip galvanized][or][zinc-plated]** steel connectors and swing or ring hangers.
- O. Iron Castings and Hangers: Malleable iron, ASTM A47/A47M, Grade 32510, hot-dip galvanized.
- P. Post Caps: **[Cast aluminum][or][color-impregnated, UV-stabilized, mold-resistant polyethylene or polypropylene]<Insert requirement>**; color to match posts.
- Q. Platform Clamps and Hangers: **[Cast aluminum][or][zinc-plated steel, not less than 0.105-inch- (2.7-mm-) nominal thickness]<Insert requirement>**.
- R. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.
- S. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

2.7 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood products according to AWP A U1 and the following:
 - 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.8 CAST-IN-PLACE CONCRETE

A. Concrete Materials and Properties:

1. Comply with requirements in [**Section 033000 "Cast-in-Place Concrete"**][**ACI 301/ (ACI 301M)**] for normal-weight[, **air-entrained**] concrete with minimum 28-day compressive strength of **3000 psi (20.7 MPa)**, **3-inch (76-mm)** slump, and **1-inch- (25-mm-)** maximum-size aggregate.
2. Dry-packaged concrete mix complying with ASTM C387/C387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength of **3000 psi (20.7 MPa)**, **3-inch (76-mm)** slump, and **1-inch- (25-mm-)** maximum-size aggregate.

2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of [**1.5 mils (0.04 mm)**]**<Insert thickness>**, medium gloss. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of [**80 mils (2 mm)**]**<Insert thickness>**. Comply with coating manufacturer's written instructions for pretreatment and application.

2.10 IRON AND STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**. Comply with coating manufacturer's written instructions for pretreatment, applying, and baking.
- B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of [**80 mils (2 mm)**][**100 mils (2.5 mm)**]**<Insert thickness>**. Comply with coating manufacturer's written instructions for pretreatment and application.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
 - 1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.
- D. Post Set with Concrete Footing: Comply with **[Section 033000 "Cast-in-Place Concrete"]****[ACI 301 (/ACI 301M)]****[dry-packaged concrete-mix manufacturer's written instructions]** for measuring, batching, mixing, transporting, forming, and placing concrete.
 - 1. Set equipment posts **[in][on]** concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
 - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
 - 2. Embedded Items: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
 - 3. Finishing Footings: Smooth top, and shape to shed water.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**.
 - 1. Perform inspection and testing for each type of installed playground equipment according to **[ASTM F1487]<Insert requirement>**.
- C. Playground equipment items will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Notify **[Architect][Owner]** 48 hours in advance of date(s) and time(s) of testing and inspection.



END OF SECTION 11 68 00 00



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Task	Specification	Specification Description
11 68 13 00	11 68 00 00	Play Field Equipment and Structures



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SECTION 11 68 16 00 - TRANSPORTATION STOP SHELTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular aluminum shelters.
2. Fabricated steel shelters.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for shelters.

B. Shop Drawings: For shelters.

1. Include plans, elevations, sections, and attachment details.
 - a. Anchor-Bolt Plans: Submit anchor-bolt plans and templates. Include location, diameter, and projection of anchor bolts required to attach shelters to concrete bases. Indicate post reactions at each location.
2. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

D. Samples for Verification: Actual sample of finished products for each type of exposed finish.

1. Size: **[Manufacturers' standard size]**<Insert size>.

E. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Environmental Product Declaration: For each product.
5. Environmental Product Declaration: For each product.
6. Environmental Product Declaration: For each product.
7. Third-Party Certifications: For each product.
8. Third-Party Certified Life Cycle Assessment: For each product.
9. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
10. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
11. Environmental Product Declaration (EPD): For each product.

12. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
13. Environmental Product Declaration: For each product.
14. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
15. Environmental Product Declaration: For each product.
16. Environmental Product Declaration: For each product.
17. Third-Party Certifications: For each product.
18. Third-Party Certified Life Cycle Assessment: For each product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports:
 1. Research Reports: For anchors, from ICC-ES.
- B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For shelters.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair finish or replace shelters that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Shelters to withstand the following loads and stresses within limits and under conditions indicated in accordance with **[ASCE/SEI 7]<Insert requirement>**:
 1. Design Loads: **[As indicated on Drawings]<Insert loads>**.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature range>**.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Safety Glazing Products: Category II materials complying with testing requirements in 16 CFR 1201.
 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of **[SGCC or another certification agency][or][manufacturer]** acceptable to authorities having jurisdiction.

2.2 MODULAR ALUMINUM SHELTERS

- A. Modular Aluminum Shelters: Fabricate shelters as an integrated set of modular components ready for assembly on Project site.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Austin Mohawk and Company, Inc.]**
 - b. **[Brasco International, Inc.]**
 - c. **[Columbia Equipment Company, Inc.]**
 - d. **[Duo-Gard Industries, Inc]**
 - e. **[Handi-Hut, Inc.]**
 - f. **[Keystone Structures, Inc.]**
 - g. **[Mardan Fabrication, Inc.]**
 - h. **[NRB Modular Solutions Inc.]**
 - i. **[Par-Kut International, Inc]**
 - j. **[Portafab Corporation]**
 - k. **[Tolar Manufacturing Company, Inc.]**
 - l. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Austin Mohawk and Company, Inc.]**
 - b. **[Brasco International, Inc.]**
 - c. **[Columbia Equipment Company, Inc.]**
 - d. **[Duo-Gard Industries, Inc]**
 - e. **[Handi-Hut, Inc.]**
 - f. **[Keystone Structures, Inc.]**
 - g. **[Mardan Fabrication, Inc.]**
 - h. **[NRB Modular Solutions Inc.]**
 - i. **[Par-Kut International, Inc]**
 - j. **[Portafab Corporation]**
 - k. **[Tolar Manufacturing Company, Inc.]**
 - l. **<Insert manufacturer's name>**
- B. Building Style: **[Open front][Dual entrance][Single entrance on left][Single entrance on right][As indicated on Drawings]**.

11 - Equipment

1. Size: [48 inches by 96 inches (1219 mm by 2438 mm)][60 inches by 120 inches (1524 mm by 3048 mm)][72 inches by 144 inches (1829 mm by 3658 mm)][96 inches by 144 inches (2438 mm by 3658 mm)]<Insert dimensions>.
- C. Structural Framework: Fabricated from manufacturer's standard **2.5-by-2.5-by-0.125-inch (64-by-64-by-3.18-mm)** aluminum tubing, channel, angle, or tee extrusions. Connect framework with exposed mechanical fasteners.
- D. Post Bases: Externally adjustable, flanged, aluminum sleeves; minimum **3-inch (76-mm)** vertical adjustment. Include shims for leveling.
- E. Anchorage: [**Cast-in-place anchor bolts**][**Postinstalled anchors**], fabricated from stainless steel, with allowable load or strength design capacities calculated to be greater than or equal to the design load.
- F. Windows: Extruded-aluminum sash frames, factory glazed with [**clear tempered float glass**][**tempered, tinted float glass**][**polycarbonate glazing**][**acrylic glazing**]<Insert glazing>.
- G. Roof: [**Flat**][**Standing seam hip**][**Standing seam gable**][**Glazed barrel vault**][**Glazed domes**] with full perimeter gutter.
 1. Exterior Roof Panels: Fabricated from **0.032-inch- (0.81-mm-)** thick, aluminum sheet with protective plastic sheet finish.
 2. Glazing: [**Polycarbonate**][**Acrylic**]<Insert glazing>.
 3. Canopy Fascia: Fabricated from **0.063-inch- (1.60-mm-)** thick aluminum sheet, of manufacturer's standard design.
 - a. Height: [**6 inches (152 mm)**][**8 inches (203 mm)**]<Insert dimension>.
 - b. Overhang: [**3 inches (76 mm)**]<Insert dimension>.
 - c. Graphics: Die-cut vinyl lettering for exterior use.
 - 1) Height: [**4 inches (102 mm)**]<Insert dimension>.
 - 2) Color: [**White**]<Insert color>.
 - 3) Font: [**Arial**]<Insert font>.
 - 4) Message: [**"Bus Stop"**][**As indicated on Drawings**]<Insert message>.
 4. Downspouts: Integral, extending **3 inches (76 mm)** beyond shelter walls.
- H. [**Integral**][**Freestanding**] Bench: [**Aluminum**][**Wood**] bench[**with backrest**].
 1. Length: [**Full length of shelter**][**Partial length to allow wheelchair access**]<Insert dimension>.
 2. Wood Species: [**Oak**][**Maple**][**Heart redwood**]<Insert species>.
 3. Armrests: Manufacturer's standard pipe armrests.
- I. Display Panels: Full width of shelter window by [**30 inches (762 mm)**][**72 inches (1829 mm)**]<Insert dimension> high for [**one**][**two**]-sided display. Front-hinged panel with locking device.
 1. Location: [**As indicated on Drawings**][**On left sidewall**]<Insert location>.
 2. Illumination: Internal [**fluorescent**][**LED**] lighting for [**front**][**back**][**perimeter**]-lit display.
- J. Shelter Accessories:
 1. Ashtray: Wall mounted, stainless steel.
 2. Wind Skirts: Aluminum-sheet closures attached to bottom rail and matching shelter finish, full length of walls. Where required for sloping base, overlapping two-piece closures, with bottom

anchored to concrete base.

- K. Electrical Power Service: 125 A, 120/240 V ac, single phase, three wire. Run copper wiring in **1/2-inch (13-mm)** EMT conduit. Exterior weatherproof connection box and lockable interior circuit breaker panel.
- L. Photovoltaic Power: Manufacturer's standard photovoltaic power generation system including **[pole][roof]**-mounted photovoltaic modules, batteries, charge controllers, inverters, and mounting structures.
- M. Lighting Fixtures: Activated by **[photocell][motion sensor][tamper-resistant concealed switch]**.
 - 1. **[One][Two]** ceiling-mounted fluorescent lighting fixture(s), **48 inches (1219 mm)** long, with acrylic lens and two 40 W lamps in each fixture.
 - 2. Ceiling-mounted LED lighting.
- N. Heating Unit: Wall-mounted **[forced-fan operation][radiant, quartz-tube]** heater, 110 V, enclosed in enameled-steel cabinet. Adjustable timer and vandal-resistant switch with engraved sign: "Push for Heat." Heating capacity of not less than **[5000 Btu/h (1465 W)][Insert value]**.
- O. Exhaust Fans: **[7-inch- (178-mm-)][10-inch- (254-mm-)][12-inch- (305-mm-)]** diameter units, capable of **[135 cfm (63 L/s)][520 cfm (245 L/s)][980 cfm (462 L/s)]<Insert value>** airflow exhaust.
- P. Materials:
 - 1. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - a. Sheet: **ASTM B209 (ASTM B209M)**.
 - b. Extruded Shapes: **ASTM B221 (ASTM B221M)**.
 - 2. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3.
 - 3. Tempered, Tinted Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3.
 - a. Tint Color: **[Blue][Blue-green][Bronze][Green][Gray]<Insert color>**.
 - 4. Acrylic Glazing: ASTM D4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).
 - a. Color: **[Colorless, transparent][White, translucent][Bronze-tinted, transparent][Gray-tinted, transparent]<Insert requirements>**.
 - 5. Polycarbonate Glazing: Thermoformable, extruded monolithic sheets, UV resistant[, **with anti-graffiti coating**] and with average impact strength of **12 to 16 ft-lb/in. (640 to 854 J/m)** of width when tested in accordance with ASTM D256, Test Method A (Izod).
 - a. Color: **[Colorless, transparent][White, translucent][Bronze-tinted, transparent][Gray-tinted, transparent]<Insert requirements>**.
- Q. Clear Anodic Finish: AAMA 611, **[AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm]** or thicker.
- R. Color Anodic Finish: AAMA 611, **[AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm]** or thicker.

1. Color: **[Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.**

- S. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**

2.3 FABRICATED STEEL SHELTERS

- A. Fabricated Steel Shelters: Factory fabricate shelters to form a completed assembly, ready for installation on Project site.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Austin Mohawk and Company, Inc.]**
- b. **[Duo-Gard Industries, Inc]**
- c. **[Keystone Structures, Inc.]**
- d. **[Little Buildings, Inc.]**
- e. **[Par-Kut International, Inc]**
- f. **[Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]**
- g. **[Tolar Manufacturing Company, Inc.]**
- h. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Austin Mohawk and Company, Inc.]**
- b. **[Duo-Gard Industries, Inc]**
- c. **[Keystone Structures, Inc.]**
- d. **[Little Buildings, Inc.]**
- e. **[Par-Kut International, Inc]**
- f. **[Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]**
- g. **[Tolar Manufacturing Company, Inc.]**
- h. **<Insert manufacturer's name>**

- B. Building Style: **[Open front][Dual entrance][Single entrance on left][Single entrance on right][As indicated on Drawings].**

1. Size: **[48 inches by 96 inches (1219 mm by 2438 mm)][60 inches by 120 inches (1524 mm by 3048 mm)][72 inches by 144 inches (1829 mm by 3658 mm)][96 inches by 144 inches (2438 mm by 3658 mm)]<Insert dimensions>.**

- C. Structural Framework: Fabricated from **2-by-2-by-0.075-inch (50-by-50-by-1.90-mm)** steel structural or mechanical tubing. Connect framework by welding.

- D. Post Bases: Externally adjustable, flanged, steel sleeves; minimum **3-inch (76-mm)** vertical adjustment. Include shims for leveling.

- E. Anchorage: **[Cast-in-place anchor bolts][Postinstalled anchors]**, fabricated from stainless steel or corrosion-resistant materials, with allowable load or strength design capacities calculated to be greater than or equal to the design load.
- F. Windows: Extruded-aluminum sash frames, factory glazed with **[clear tempered float glass][tempered, tinted float glass][polycarbonate glazing][acrylic glazing]<Insert glazing>**.
- G. Roof: **[Flat][Standing seam hip][Standing seam gable][Glazed barrel vault][Glazed domes]** with full perimeter gutter.
 - 1. Exterior Roof Panels: Fabricated from **[0.079-inch (2.01-mm)][0.064-inch (1.63-mm)]** nominal-thickness, galvanized-steel sheet; with **[painted finish][EPDM membrane]**, continuously welded seams.
 - 2. Glazing: **[Polycarbonate][Acrylic]<Insert glazing>**.
 - 3. Canopy Fascia: Fabricated from **0.079-inch (2.01-mm)** nominal-thickness, galvanized-steel sheet, of **[manufacturer's standard design][custom design indicated on Drawings]**.
 - a. Height: **[6 inches (152 mm)][8 inches (203 mm)]<Insert dimension>**.
 - b. Overhang: **[3 inches (76 mm)]<Insert dimension>**.
 - c. Graphics: Die-cut vinyl lettering for exterior use.
 - 1) Height: **[4 inches (102 mm)]<Insert dimension>**.
 - 2) Color: **[White]<Insert color>**.
 - 3) Font: **[Arial]<Insert font>**.
 - 4) Message: **["Bus Stop"][As indicated on Drawings]<Insert message>**.
 - 4. Downspouts: Integral, extending **3 inches (76 mm)** beyond shelter walls.
- H. **[Integral][Freestanding]** Bench: **[Steel][Wood]** bench **[with backrest]**.
 - 1. Length: **[Full length of shelter][Partial length to allow wheelchair access]<Insert dimension>**.
 - 2. Wood Species: **[Oak][Maple][Heart redwood]<Insert species>**.
 - 3. Armrests: Manufacturer's standard pipe armrests.
- I. Display Panels: Full width of shelter window by **[30 inches (762 mm)][72 inches (1829 mm)]<Insert dimension>** high for **[one][two]**-sided display. Front-hinged panel with locking device.
 - 1. Location: **[As indicated on Drawings][On left sidewall]<Insert location>**.
 - 2. Illumination: Internal **[fluorescent][LED]** lighting for **[front][back][perimeter]**-lit display.
- J. Shelter Accessories:
 - 1. Ashtray: Wall mounted, stainless steel.
 - 2. Wind Skirts: Steel-sheet closures attached to bottom rail and matching shelter finish, full length of walls. Where required for sloping base, overlapping two-piece closures, with bottom anchored to concrete base.
- K. Electrical Power Service: 125 A, 120/240 V ac, single phase, three wire. Run copper wiring in **1/2-inch (13-mm)** EMT conduit. Exterior weatherproof connection box and lockable interior circuit breaker panel.
- L. Photovoltaic Power: Manufacturer's standard photovoltaic power generation system including **[pole][roof]**-mounted photovoltaic modules, batteries, charge controllers, inverters, and mounting structures.
- M. Lighting Fixtures: Activated by **[photocell][motion sensor][tamper-resistant concealed switch]**.

1. **[One][Two]** ceiling-mounted fluorescent lighting fixture(s), **48 inches (1219 mm)** long, with acrylic lens and two 40 W lamps in each fixture.
 2. Ceiling-mounted LED lighting.
- N. Heating Unit: Wall-mounted **[forced-fan operation][radiant, quartz-tube]** heater, 110 V, enclosed in enameled-steel cabinet. Adjustable timer and vandal-resistant switch with engraved sign: "Push for Heat." Heating capacity of not less than **[5000 Btu/h (1465 W)]<Insert value>**.
- O. Exhaust Fans: **[7-inch- (178-mm-)][10-inch- (254-mm-)][12-inch- (305-mm-)]** diameter units, capable of **[135 cfm (63 L/s)][520 cfm (245 L/s)][980 cfm (462 L/s)]<Insert value>** airflow exhaust.
- P. Materials:
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, commercial quality, **G90 (Z275)** coating designation; mill phosphatized.
 2. Steel Structural Tubing: ASTM A500/A500M, Grade B.
 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 4. Steel Mechanical Tubing: ASTM A513/A513M, welded-steel mechanical tubing.
 5. Zinc-Coated (Galvanized) Steel: Hot-dip galvanized in accordance with ASTM A123/A123M.
 6. Anchorages: Anchor bolts; **[hot-dip galvanized in accordance with ASTM A153/A153M or ASTM F2329/F2329M][stainless steel]**.
 7. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3.
 8. Tempered, Tinted Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3.
 - a. Tint Color: **[Blue][Blue-green][Bronze][Green][Gray]<Insert color>**.
 9. Acrylic Glazing: ASTM D4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).
 - a. Color: **[Colorless, transparent][White, translucent][Bronze-tinted, transparent][Gray-tinted, transparent]<Insert requirements>**.
 10. Polycarbonate Glazing: Thermoformable, extruded monolithic sheets, UV resistant, **with anti-graffiti coating** and with average impact strength of **12 to 16 ft-lb/in. (640 to 854 J/m)** of width when tested in accordance with ASTM D256, Test Method A (Izod).
 - a. Color: **[Colorless, transparent][White, translucent][Bronze-tinted, transparent][Gray-tinted, transparent]<Insert requirements>**.
- Q. Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on enamel or powder-coat finish consisting of prime coat and thermosetting topcoat.
1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for

installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; and critical dimensions; and other conditions affecting performance of the Work.

- B. Examine roughing-in for electrical system to verify actual locations of connections before shelter installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install shelters in accordance with manufacturer's written instructions.
- B. Set shelters plumb and aligned with full bearing on concrete bases.
- C. Fasten shelters securely to concrete base with anchorage indicated.
- D. Connect to electrical power.
- E. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 11 68 16 00



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Task	Specification	Specification Description
11 68 16 00	11 68 00 00	Play Field Equipment and Structures
11 68 23 00	11 68 00 00	Play Field Equipment and Structures
11 68 23 13	11 68 00 00	Play Field Equipment and Structures
11 68 23 33	11 68 00 00	Play Field Equipment and Structures
11 68 33 00	11 68 00 00	Play Field Equipment and Structures
11 68 33 13	11 68 00 00	Play Field Equipment and Structures
11 68 33 23	11 68 00 00	Play Field Equipment and Structures
11 68 33 33	11 68 00 00	Play Field Equipment and Structures
11 71 00 00	01 11 19 00	No Specification Required



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SECTION 11 73 00 00 - PATIENT CARE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceiling-mounted patient-lift systems.
2. Intravenous (IV) tracks, carriers, and bottle holders.
3. Patient-bed locators.
4. Patient-bed service walls.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for above-ceiling supplementary framing for support and anchorage of patient-lift systems.
2. Section 092216 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.
3. Section 102123 "Cubicle Curtains and Tracks" for patient-room cubicles.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for specimen pass-through cabinets and boxes and for bedpan and urinal cabinets and boxes.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of components. Indicate location and size of each field connection.
3. Include diagrams for service connections and power, signal, and control wiring.

- C. Samples: For each exposed product and for each color and texture specified, **10 inches (254 mm)** long in size.

- D. Samples for Initial Selection: For each type of exposed finish.

1. Include Samples of accessories involving color and finish selection.

- E. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

1. Include Samples of accessories to verify color and finish selection.
2. Ceiling-Mounted Patient-Lift Systems: Not less than **10-inch- (254-mm-)** long, track sections.
3. IV Track Systems:

11 - Equipment

- a. Track: Not less than **10 inches (254 mm)** long.
- b. IV Carrier: Full-size unit.
- c. IV Hanger: Full-size unit.
4. Patient-Bed Locators: Not less than **10 inches (254 mm)** square.
5. Patient-Bed Service Walls: Not less than **10 inches (254 mm)** square for fascia and not less than **10 inches (254 mm)** long for trim and rails.

- F. Product Schedule: For patient care equipment.[**Use same designations indicated on Drawings**].
- G. Delegated-Design Submittal: For above-ceiling supplementary framing for support and anchorage of patient-lift systems, signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For ceiling-mounted patient-lift systems, reflected ceiling plan(s), and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
 2. Structural members to which ceiling-mounted patient-lift systems will be attached.
 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. **<Insert item>**.
 4. Perimeter moldings.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For products to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical installation of the following as shown on Drawings[**as part of patient-room mockup**]:
 - a. Ceiling-mounted patient-lift system.
 - b. IV track, carrier, and bottle holder.
 - c. Patient-bed locators.
 - d. Patient-bed service walls.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design above-ceiling supplementary framing for support and anchorage of patient-lift systems.

2.2 CEILING-MOUNTED PATIENT-LIFT SYSTEMS

- A. Ceiling-Mounted Patient Lift: Consisting of a motor-driven lift unit that traverses on a ceiling-mounted track system.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Arjo Inc.]**
 - b. **[Guldmann Inc.]**
 - c. **[Hill-Rom Services, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arjo Inc.]**
 - b. **[Guldmann Inc.]**
 - c. **[Hill-Rom Services, Inc.]**
 - d. **<Insert manufacturer's name>**
- B. Ceiling-Mounted Track System: High-strength extruded aluminum in manufacturer's standard profile and thickness to support lifting capacity indicated for lift unit. Provide track shapes and accessories as required to provide a complete system in layout indicated on Drawings.
- C. Lift Unit: Steel frame system with separate 24-V dc lifting and horizontal-drive motors secured to chassis.
 1. Lifting Capacity: **[440 lb (200 kg)][550 lb (250 kg)][660 lb (300 kg)][770 lb (350 kg)]<Insert capacity>**.
 2. Maximum Lift Range: **[96 inches (2438 mm)]<Insert dimension>**.
 3. Safety Features:
 - a. Emergency stop.
 - b. Emergency lowering device, mechanical and electrical.
 - c. Control of lift strap.
 - d. Cut-off Angle: 45 degrees along the rail; 10 degrees across the rail.

4. Electronics:

- a. Control Unit: **[Walk-along, hand-held][Wireless remote-]**control unit.
- b. On/Off Control: Soft start and stop with overload protection.
- c. Battery Power: 24-V rechargeable nickel-metal hydride batteries in quantity required for lifting capacity indicated. Provide with electric battery charging station that provides maximum charge time of two hours per battery.
 - 1) Provide **[wall][ceiling]-**mounted charging station at end of track.**[Provide supplemental clip-on charging station with indicator lights.]**
- d. Battery Protection: Low-battery light illuminates when battery voltage is below 22 V; hoist disabled when battery voltage is below 20 V.
- e. Motors: Provide in quantity required by lifting capacity indicated.
 - 1) Lift Motors: **[2.3 inches (6 cm)]<Insert dimension>** per second lift speed at maximum capacity load.
 - 2) Horizontal-Drive Motors: **[5.9 inches (150 mm)]<Insert dimension>** per second horizontal traverse at maximum capacity load.

D. Accessories:

1. Threaded nylon straps and polyester/nylon-net sling to support and cradle patient.
2. Room-to-room carry bar.
3. Two-point carry bar**[with locking clips]**.
4. Four-point carry bar**[with locking clips]**.
5. Tandem carry bar.
6. Bariatric carry bar.
7. **<Insert accessories>**.

2.3 IV TRACKS, CARRIERS, AND BOTTLE HOLDERS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Alderman Acres Manufacturing, Inc.]**
2. **[AR Nelson]**
3. **[Automatic Devices Company]**
4. **[Barjan Manufacturing Ltd.]**
5. **[Covoc Corporation]**
6. **[Healthcare Curtains]**
7. **[Imperial Fastener Company, Inc.]**
8. **[Pryor Products, Inc.]**
9. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Alderman Acres Manufacturing, Inc.]**
2. **[AR Nelson]**
3. **[Automatic Devices Company]**
4. **[Barjan Manufacturing Ltd.]**
5. **[Covoc Corporation]**

6. **[Healthcare Curtains]**
 7. **[Imperial Fastener Company, Inc.]**
 8. **[Pryor Products, Inc.]**
 9. **<Insert manufacturer's name>**
- C. IV Tracks: Extruded aluminum, not less than 1-1/4 inches wide by 3/4 inch high (32 mm wide by 19 mm high).)
1. Track Minimum Wall Thickness: **[0.058 inch (1.47 mm)][0.062 inch (1.57 mm)][Manufacturer's standard]<Insert dimension>**.
 2. Curved Track: Factory-fabricated, **[12-inch- (305-mm-)]<Insert dimension>** radius bends.
 3. Finish: **[Clear anodized][Satin anodized][Baked enamel, acrylic, or epoxy]<Insert finish>**.
- D. IV Carriers: Four nylon rollers and **[nylon][steel][stainless-steel]** axles with hanger loop fabricated from **1/4-inch- (6-mm-)** diameter, stainless steel.
1. Provide carriers with ball bearings.
- E. Stationary IV Bottle Holders: **[24-inch (610-mm)][30-inch (762-mm)][36-inch (914-mm)][42-inch (1067-mm)][48-inch (1219-mm)]<Insert dimension>** fixed height with stainless-steel shaft.
1. Arms: **[Four][Eight]<Insert number>** 1/4-inch (6-mm) stainless-steel arms with loops.
 - a. Type: **[Folding][Nonfolding]**.
 - b. Bottom Loop: Stainless steel.
 - c. Top Loop: Stainless steel, **[coated for nonconductivity][uncoated]**.
- F. Telescoping IV Bottle Holders: **[28-inch (711-mm)][39-inch (991-mm)][45-inch (1143-mm)][51-inch (1295-mm)][57-inch (1448-mm)]<Insert dimension>** overall height with a 3/4-inch (19-mm) stainless-steel main shaft and a 3/8-inch (9.5-mm) stainless-steel inner shaft, minimum vertical adjustment of **16 inches (406 mm)**.
1. Arms: **[Four][Eight]<Insert number>** 1/4-inch (6-mm) stainless-steel arms with loops.
 - a. Type: **[Folding][Nonfolding]**.
 - b. Bottom Loop: Stainless steel.
 - c. Top Loop: Stainless steel, **[coated for nonconductivity][uncoated]**.
 2. Adjustment Control: **[Push button][Release ring]**.

2.4 PATIENT-BED LOCATORS

- A. Patient-Bed Locator : Surface-mounted docking station with conduit raceway provisions for eight power-service connections, four on each side, that is UL listed and labeled and complying with NFPA 70, and that ensures proper positioning of patient beds and protects wall surfaces from impact and abrasion damage caused by contact with patient bed.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amico Corporation]**
 - b. **[Hospital Systems, Inc]**
 - c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amico Corporation]**
 - b. **[Hospital Systems, Inc]**
 - c. **<Insert manufacturer's name>**
3. Enclosure: Manufacturer's standard high-impact plastic, **[one][two]** piece(s).
 - a. Color and Pattern: **[As selected by Architect from manufacturer's full range]<Insert requirements>**.
 - b. Height: **[22-1/2 inches (572 mm), nominal]<Insert dimension>**.
 - c. Width: **[50 inches (1270 mm), nominal]<Insert dimension>**.
 - d. Overall Depth: **[4-5/8 inches (118 mm), nominal]<Insert dimension>**.
4. Power Services:
 - a. Normal power.
 - b. Critical power.
 - c. Low-voltage power and communication.
5. Accessories:
 - a. Direct and indirect lighting fixture.
 - b. **<Insert accessory>**.

2.5 PATIENT-BED SERVICE WALLS

- A. Patient-Bed Service Wall : Headwall system; UL listed and labeled; complying with NFPA 70 and NFPA 99; with integrated raceways that provide single-area connection for power services and communication wiring and single connection for hard-piped and brazed medical gas piping.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amico Corporation]**
 - b. **[Hospital Systems, Inc]**
 - c. **[Modular Services Company]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amico Corporation]**
 - b. **[Hospital Systems, Inc]**
 - c. **[Modular Services Company]**
 - d. **<Insert manufacturer's name>**
 3. Type: **[Horizontal][Vertical][Panel]**.

- a. Unit Overall Length: **[As indicated on Drawings]<Insert dimension>**.
 - b. Unit Overall Width: **[As indicated on Drawings]<Insert dimension>**.
 - c. Panel Sizes: **[As indicated on Drawings]<Insert dimension>**.
4. Fascia Panels: Removable for installation and maintenance of services, **[high-pressure plastic][high-pressure laminate]<Insert requirements>**.
 - a. Color and Pattern: **[As selected by Architect from manufacturer's full range]<Insert requirements>**.
5. Fascia Panel Reveals: **[3/8-inch (9.5-mm) flush concave][3/8-inch (9.5-mm) protruding][Manufacturer's standard]<Insert requirements>**.
 - a. Reveal Finish: **[Black][Aluminum]<Insert requirements>**.
6. Enclosure/Frame: **[Anodized aluminum][Galvanized steel]<Insert requirements>**.
7. Mounting: **[Surface][Recessed, single sided][Recessed, double sided]**.
 - a. Unit Depth: **[As indicated on Drawings][5 inches (127 mm), nominal][As required by wall construction indicated on Drawings]<Insert dimension>**.
8. Accessory Rails: **[Two][Four][As indicated on Drawings]<Insert requirements>**.
9. Medical Gas Services:
 - a. Oxygen.
 - b. Medical air.
10. Medical Vacuum Services: ASME B16.22 copper vacuum-service tubes.
11. Gas Manifold: Machined aluminum block with CGA V-5 diameter, indexed safety system, gas-specific check valves.
12. Power Services:
 - a. Normal power.
 - b. Critical power.
 - c. Low-voltage power.
13. Isolated Power Systems Equipment: UL 1047.
14. Metallic Outlet Boxes: UL 514A.
15. Accessories:
 - a. Arm light, compact fluorescent.
 - b. Bottle slide.
 - c. Blood-pressure gage mount.
 - d. Charting shelf.
 - e. Glove-box mount.
 - f. Light, utility track mounted.
 - g. Integrated diagnostic system mount.
 - h. ISS transfer pole with mount.
 - i. IV resuscitator hook, dual.
 - j. Ophthalmoscope mount.
 - k. Post-type utility mount.
 - l. Resuscitator bag holder.
 - m. Sharps-container mount.
 - n. Shelf, **[mayo][swivel]**.
 - o. Speculum mount.
 - p. Universal charting light with mount.

- q. Universal holder.
- r. Universal light mount.
- s. Universal pole holder, C-clamp.
- t. Utility hook.
- u. Utility otoscope mount.
- v. Utility shelf.
- w. Utility slide mount.
- x. <Insert accessory>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CEILING-MOUNTED PATIENT-LIFT SYSTEMS

- A. Install tracks level and plumb, according to manufacturer's written instructions.
 - 1. Support track directly from **[structure][overhead supplementary framing]** using manufacturer's standard supports, anchors, and fasteners at intervals required by lifting capacity indicated, but not less than **[36 inches (914 mm)]<Insert dimension>** o.c.
 - 2. Brace direct-to-structure track supports where distance between suspended ceiling and anchors is more than **18 inches (457 mm)**.
 - 3. Provide supports at each track end, splice, and tangent point of each corner.
 - 4. Install track accessories, splices, end caps, connectors, coupling and joining devices, and other accessories as required for a secure and operational installation.

3.3 IV TRACKS, CARRIERS, AND BOTTLE HOLDERS

- A. Install tracks level and plumb, according to manufacturer's written instructions.
- B. For tracks up to **20 feet (6.0 m)** in length, provide track fabricated from single, continuous length.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 - 1. Mechanically fasten directly to bottom of concrete deck with post-installed anchors.
 - 2. Mechanically fasten directly to finished ceiling with toggle bolts.
 - 3. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
 - 4. Mechanically fasten to suspended ceiling grid with screws.
 - 5. Attach track to suspended ceiling grid with manufacturer's proprietary clip.
- D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

- E. IV Bottle Holders: Unless otherwise indicated, install one IV hook on each IV track and hang one IV hanger.

3.4 PATIENT-BED LOCATORS

- A. Install bed locators level and plumb, according to manufacturer's written instructions.
- B. Accurately fit, align, securely fasten, and install bed locators free from distortion or defects.

3.5 PATIENT-BED SERVICE WALLS

- A. Install service walls level and plumb, according to manufacturer's written instructions.
- B. Accurately fit, align, securely fasten, and install service walls free from distortion or defects.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: For patient-bed service walls, perform periodic installation inspections to ensure that products are installed according to manufacturer's written instructions.
 - 1. Installation Inspections: Inspect product installations when installation work is **[25, 60, and 100 percent complete]**<Insert requirements>.
 - 2. Installation Inspection Reports: Indicate if product installations comply with manufacturer's written instructions and corrective actions required if any.

3.7 ADJUSTING

- A. Adjust products for proper function and operation to comply with manufacturer's written instructions.

3.8 PROTECTION

- A. Protect installed products from damage for the remainder of the construction period.
- B. Repair damaged products according to manufacturer's written instructions. If damaged products cannot be successfully repaired, as determined by Architect, remove and replace damaged products.

END OF SECTION 11 73 00 00



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Task	Specification	Specification Description
11 73 23 00	11 73 00 00	Patient Care Equipment



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SECTION 11 82 26 00 - FACILITY WASTE COMPACTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Facility waste compactors.

B. Related Requirements:

1. Section 113013 "Residential Appliances" for residential trash compactors.
2. Section 114000 "Foodservice Equipment" for food-waste shredding, pulping, grinding, and compacting machines in foodservice facilities.
3. Section 149182 "Trash Chutes" for waste chutes and diverters servicing waste compactors.
4. Section 211000 "Water-Based Fire-Suppression Systems" for building fire sprinklers and piping connections to automatic sprinkler in hopper of each chute-fed compactor.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1. Inspect and discuss electrical, plumbing, and sprinkler roughing-in; equipment bases; and other preparatory work specified elsewhere.
2. Review coordination of chute[**and diverter**] locations with waste compactors.
3. Review sanitary requirements for water bibs, floor drains, and grease traps if required for Project to reduce decomposition and odors.
4. Review haul routes of waste to the compactor, route of hauler's equipment, and protections along these routes that are specified elsewhere.
5. Review required testing, inspection, and certification procedures.
6. **<Insert requirement>**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties and accessories, and finishes.

B. Shop Drawings: For each waste compactor and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Dimension chute[**and diverter**] locations that interface with waste compactors.
4. Include location and installation details of automatic sprinkler in hopper of each chute-fed compactor.

5. Indicate equipment access points and required space for equipment service and operation.
6. Include setting drawings, templates, and instructions for installing anchor bolts and other anchorages.
7. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of waste compactor.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For waste compactors to include in operation and maintenance manuals.
- B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 1. Maintenance Proximity: Not more than **[one][two]<Insert number>** hour(s') normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 FACILITY WASTE COMPACTORS

- A. Waste Compactor : Manufacturer's standard **[stationary-horizontal][self-contained horizontal][compactor-container (combination-container)][vertical][pivoting-ram]<Insert type>** - type stationary compactor, complying with requirements[; **liquidtight**]; and with components, options, and accessories needed to provide a complete, functional system.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Compactors, Inc.]**
 - b. **[Cram-A-Lot; J.V. Manufacturing, Inc.]**
 - c. **[Harmony Enterprises, Inc.]**
 - d. **[Marathon Equipment Company; a Dover company]**
 - e. **[Precision Machinery Systems LLC]**

- f. [PTR Baler & Compactor Company]
 - g. [Rudco Products, Inc.]
 - h. [Sebright Products, Inc.]
 - i. [SP Industries, Inc.]
 - j. [Wastequip, LLC]
 - k. [Western Chutes; Buchanan Company, Inc.]
 - l. [Wilkinson Hi-Rise, LLC]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Compactors, Inc.]
 - b. [Cram-A-Lot; J.V. Manufacturing, Inc.]
 - c. [Harmony Enterprises, Inc.]
 - d. [Marathon Equipment Company; a Dover company]
 - e. [Precision Machinery Systems LLC]
 - f. [PTR Baler & Compactor Company]
 - g. [Rudco Products, Inc.]
 - h. [Sebright Products, Inc.]
 - i. [SP Industries, Inc.]
 - j. [Wastequip, LLC]
 - k. [Western Chutes; Buchanan Company, Inc.]
 - l. [Wilkinson Hi-Rise, LLC]
 - m. <Insert manufacturer's name>
3. Source Limitations: Obtain from single source from single manufacturer.
4. Waste-Compactor Standards: ANSI Z245.21[**including appendices**] and NFPA 82.
5. Waste-Container Standards: ANSI Z245.30 and ANSI Z245.60.
6. Rated Size (Volume): Minimum [0.14 cu. yd. (0.11 cu. m)][1.00 cu. yd. (0.77 cu. m)][1.50 cu. yd. (1.15 cu. m)][2.00 cu. yd. (1.53 cu. m)][3.50 cu. yd. (2.68 cu. m)][5.00 cu. yd. (3.82 cu. m)][7.50 cu. yd. (5.73 cu. m)][10.00 cu. yd. (7.65 cu. m)]<Insert volume>.
7. Clear Top Opening (Length by Width): Minimum [20 by 28 inches (508 by 711 mm)][24 by 36 inches (610 by 914 mm)][30 by 48 inches (762 by 1219 mm)][60 by 48 inches (1524 by 1219 mm)][108 by 72 inches (2743 by 1829 mm)]<Insert dimensions>.
8. Cycle Time: Maximum [30][40][50][60][70]<Insert number> seconds.
9. Discharge Opening (Width by Height): Maximum <Insert dimensions>.
10. Ground Height: Minimum <Insert dimension>.
11. Ram Face: Minimum <Insert dimensions>.
12. Ram Penetration: Minimum <Insert dimension>.
13. Normal/Maximum Resultant Ram Forces: [20,000/22,000 lbf (89/98 kN)][36,000/40,000 lbf (160/178 kN)][70,000/80,000 lbf (311/356 kN)][125,000/150,000 lbf (556/667 kN)]<Insert values>.
14. Normal/Maximum System Pressures: [1600/1800 psi (11.0/12.4 MPa)][2000/2400 psi (13.8/16.5 MPa)][2500/2800 psi (17.2/19.3 MPa)]<Insert values>.
15. Scale Weight: Maximum [2500 lb (1134 kg)][6000 lb (2722 kg)][12,000 lb (5443 kg)][20,000 lb (9072 kg)]<Insert value>.
16. Electrical Characteristics:
 - a. Horsepower: [3][10][15][20][30][50]<Insert number> hp.
 - b. Voltage: [115 V ac single phase, 60 Hertz][230 V ac, single phase, 60 Hertz][208 V ac, three phase, 60 Hertz][230 V ac, three phase, 60 Hertz][460 V ac three phase, 60 Hertz].
17. Controls: <Insert control features>.



18. Finish: **[Manufacturer's standard][Manufacturer's standard primer for field painting]<Insert requirement>**.

a. Color: **[White][Black][Gray][Dark green][Yellow][As selected by Architect from manufacturer's full range]<Insert color>**.

19. Deodorizing Device: **[Manufacturer's standard]<Insert requirement>**.

20. **<Insert requirement>**.

B. Number of Extra Storage Containers: **[One][Two]<Insert number>**.

2.2 FABRICATION

A. Fabricate waste compactors with smooth, eased, exposed edges to prevent injury to persons in vicinity of the equipment.

B. Fabricate containers, hoppers, compaction chambers, unit bodies, and similar components of steel with welded joints. Reinforce with steel members sized and spaced to withstand impacts and pressures of normal operations and to prevent deformation.

C. Fabricate equipment with replaceable parts at points of normal wear.

D. Fabricate liquidtight compactor baffles to stop liquid from leaking out.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, clearances, service rough-ins, and other conditions affecting performance of the Work.

B. Examine walls, floors, and chutes for suitable conditions where each waste compactor will be installed.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FACILITY WASTE COMPACTORS

A. Install each waste compactor according to manufacturer's written instructions, ANSI Z245.2, and ANSI Z245.21[, **including appendices**].

B. Install automatic sprinkler in hopper of each chute-fed compactor according to NFPA 82.

C. Set waste compactors level, plumb, properly aligned, and securely in place. Anchor as required for secure operation.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform installation and startup checks according to[**ANSI Z245.21, Appendix D, "Tests for Evaluation of Equipment and Performance," and**] manufacturer's written instructions.
 - 2. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Verify unrestricted access to each firefighting access door or hose connection required by ANSI Z245.21 and NFPA 82 for compactor container(s).
 - 4. Verify correct locations, color coding, and legibility of caution, warning, and danger markings.
 - 5. Certify compliance with test parameters.
- B. A waste compactor will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, initial maintenance service shall include [12]<Insert number> months' full maintenance by skilled employees of waste-compactor Installer. Include [monthly]<Insert frequency> preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper waste-compactor operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain waste compactors according to manufacturer's written instructions and ANSI Z245.2.

END OF SECTION 11 82 26 00



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SECTION 11 97 26 00 - DETENTION GUN LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pistol lockers.
2. Tilt-out pistol lockers.

B. Related Requirements:

1. Section 119814 "Detention Door Hardware" for cylinders and keying for detention gun lockers.
2. Section 125500 "Detention Furniture" for detention furniture.

1.2 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B. Coordinate installation of anchorages for detention gun lockers. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.
- C. Coordinate size and location of recesses in wall construction to receive recessed detention gun lockers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention gun lockers.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For detention gun lockers.

1. Include plans, elevations, sections, and attachment details.
2. Indicate locations, dimensions, and profiles of wall and floor reinforcements.

3. Indicate locations and installation details of built-in anchors.
4. Show elevations and indicate dimensions of detention gun lockers, preparations for receiving anchors, and locations of anchorage.
5. Show details of attachment of detention gun lockers to built-in anchors.

D. Samples for Initial Selection: For detention gun lockers with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Examination reports documenting inspections of substrates, areas, and conditions.
- C. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- D. Field quality-control reports documenting inspections of installed products.
 1. Field quality-control certification signed by Contractor[**and Detention Specialist**].

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify openings for recessed detention gun lockers by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.

2.2 PISTOL LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[American Jail Products L.L.C.]**
 2. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 3. **[Detention Device Systems (DDS); DDS Group]**

4. [Maximum Security Products Corp]
 5. [PSI LLC]
 6. [Southern Folger Detention Equipment Company]
 7. [Sweeper Metal Fabricators Corp]
 8. [Tiffin Metal Products Co.]
 9. [Willo Products Company, Inc.]
 10. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [American Jail Products L.L.C.]
 2. [BarkerBuilt, Division of Bob Barker Company, Inc]
 3. [Detention Device Systems (DDS); DDS Group]
 4. [Maximum Security Products Corp]
 5. [PSI LLC]
 6. [Southern Folger Detention Equipment Company]
 7. [Sweeper Metal Fabricators Corp]
 8. [Tiffin Metal Products Co.]
 9. [Willo Products Company, Inc.]
 10. <Insert manufacturer's name>
- C. Cabinet: Minimum **20 inches (508 mm)** wide by **15 inches (381 mm)** high by **10 inches (254 mm)** deep; formed from **[0.134-inch (3.42-mm) nominal-thickness steel sheet][0.141-inch (3.57-mm) nominal-thickness stainless steel sheet]**. Line each compartment with mothproofed felt or nonabsorbing, closed-cell padding.
1. Compartments: **[Six]<Insert number>**.
- D. Doors: Formed from **[3/16-inch- (4.8-mm-) thick steel plate][0.180-inch (4.55-mm) nominal-thickness steel sheet][same material as cabinet]**, supported by heavy-duty continuous bottom hinge.
- E. Locks: **[Snap][Cylinder]** type, keyed differently[**and master keyed**]; provide one lock for each compartment.
1. Lock Preparation: Prepare door panel to accept cylinder specified in Section 119814 "Detention Door Hardware."
- F. Mounting: **[Surface][Recessed, with mounting flange formed from same material as body]**.
- G. Materials:
1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
 3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- H. Finishes:
1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film

thickness of **2 mils (0.05 mm)**.

- a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
3. Stainless Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 3.

2.3 TILT-OUT PISTOL LOCKERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[American Jail Products L.L.C.]**
 2. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 3. **[Detention Device Systems (DDS); DDS Group]**
 4. **[Maximum Security Products Corp]**
 5. **[Norix Group, Inc.]**
 6. **[PSI LLC]**
 7. **[Southern Folger Detention Equipment Company]**
 8. **[Sweeper Metal Fabricators Corp]**
 9. **[Willo Products Company, Inc.]**
 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[American Jail Products L.L.C.]**
 2. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 3. **[Detention Device Systems (DDS); DDS Group]**
 4. **[Maximum Security Products Corp]**
 5. **[Norix Group, Inc.]**
 6. **[PSI LLC]**
 7. **[Southern Folger Detention Equipment Company]**
 8. **[Sweeper Metal Fabricators Corp]**
 9. **[Willo Products Company, Inc.]**
 10. **<Insert manufacturer's name>**
- C. Cabinet: Minimum **39 inches (991 mm)** wide by **15 inches (381 mm)** high by **6 inches (152 mm)** deep; formed from **[0.134-inch (3.42-mm) nominal-thickness steel sheet][0.141-inch (3.57-mm) nominal-thickness stainless steel sheet]**.
 1. Compartments: **[Six]<Insert number>**.

- D. Tilt-Out Compartments: Doors formed from **[3/16-inch- (4.8-mm-) thick steel plate][0.180-inch (4.55-mm) nominal-thickness steel sheet][same material as cabinet]**, supported by heavy-duty continuous bottom hinge, with attached tilt-out compartment with formed metal sides. Line each compartment with mothproofed felt or nonabsorbing, closed-cell padding.
- E. Locks: **[Snap][Cylinder]** type, keyed differently **[and master keyed]**; provide one lock for each compartment.
 - 1. Lock Preparation: Prepare door panel to accept cylinder specified in Section 119814 "Detention Door Hardware."
- F. Mounting: **[Surface][Recessed, with mounting flange formed from same material as body]**.
- G. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
 - 3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 - 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
- H. Finishes:
 - 1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish, consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 - 3. Stainless Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 3.

2.4 FABRICATION

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of detention gun lockers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces

aligned unless otherwise indicated.

- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Form and grind edges and corners to be free of sharp edges or rough areas.
- E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- F. Weld corners and seams continuously to comply with referenced AWS standard and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended at exposed connections, so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention gun lockers rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- H. Cut, reinforce, drill, and tap detention gun lockers as indicated to receive hardware, fasteners, and similar items.
- I. Form exposed work true to line and level with accurate angles, surfaces, and straight sharp edges.
- J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.5 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to **[4]<Insert safety factor>** times the load imposed, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hot-dip galvanized in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
- C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- D. Proprietary Built-in Masonry Anchors: Fabricated from **[0.134-inch (3.42-mm) nominal-thickness steel sheet][1/4-inch (6-mm) nominal-thickness steel plate][1/2-inch (12.7-mm) nominal-thickness steel plate]** into **[6-inch- (152-mm-)][8-inch- (203-mm-)]** deep blocks matching size of concrete masonry units; **with weld nuts attached on inside to receive field-bolted attachments**.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[M/BED Block Systems, LLC.]**
 - b. **[Peterson Detention Inc. (PDI)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[M/BED Block Systems, LLC.]**
 - b. **[Peterson Detention Inc. (PDI)]**
 - c. **<Insert manufacturer's name>**
 3. Finish: **[Factory primed for field painting for anchors with field-welded attachments][Polyester powder coat for anchors with bolted attachments][Epoxy paint for anchors with bolted attachments]**.
- E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention gun lockers.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention gun lockers before detention gun locker installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention gun lockers.
- D. Inspect built-in and cast-in anchor installations, before installing detention gun lockers, to verify that anchor installations comply with requirements. Prepare inspection reports.
 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Verify locations of detention gun lockers with those indicated on Shop Drawings.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for

securing detention gun lockers to in-place construction. Include threaded fasteners for [concrete][and][masonry] inserts and other connectors.

- B. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention gun lockers. Set detention gun lockers accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into [concrete][or][masonry] or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- E. Adjust doors and latches of detention gun lockers to operate easily without binding. Verify that integral locking devices operate properly.
- F. Assemble detention gun lockers requiring field assembly with security fasteners with no exposed fasteners on exposed faces and frames.

3.3 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace detention work if inspections indicate that work does not comply with specified requirements. Remove malfunctioning units; replace with new units.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification[, **endorsed by Detention Specialist,**] that states installed products and their installation comply with requirements in the Contract Documents.

END OF SECTION 11 97 26 00



Task	Specification	Specification Description
11 97 26 00	12 55 00 00	Detention Furniture



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SECTION 11 98 12 00 - DETENTION ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bar-grille assemblies.
2. Woven-rod-mesh assemblies.
3. Security grilles.
4. Perforated-plate security vents.
5. Perforated-plate security vents with wire mesh.
6. Perforated-plate security vents with backup plate.
7. Tool-resisting-steel, perforated-plate security vents.
8. Security fasteners.

B. Related Requirements:

1. Section 013513.16 "Special Project Procedures for Detention Facilities" for general requirements for detention work.
2. Section 099113 "Exterior Painting" for field painting of detention enclosures.
3. Section 099123 "Interior Painting" for field painting of detention enclosures.

1.2 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B. Coordinate installation of anchorages for detention enclosures. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.
- C. Coordinate size of security grilles and vents with size of ducts.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention enclosures.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration: For each product.
12. Health Product Declaration: For each product.
13. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
14. Environmental Product Declaration: For each product.
15. Environmental Product Declaration: For each product.
16. Environmental Product Declaration: For each product.
17. Third-Party Certifications: For each product.
18. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For detention enclosures.

1. Include plans, elevations, sections, and attachment details.
2. Indicate location, plan, and dimension of each detention enclosure.
3. Indicate type of steel for each detention enclosure component.
4. Indicate requirements for cast-in anchors to be installed as work of other Sections.
5. Show elevations of each detention enclosure door and indicate location, dimensions, door swing/slide direction, details of detention door hardware and accessories, and preparations for power, signal, and control systems.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of detention enclosure indicated.

1. Include **12-by-12-inch (305-by-305-mm)** cut-away corner section of bar-grille assembly, constructed of specified round and flat bars, showing fabrication techniques and workmanship.
2. Include **12-by-12-inch (305-by-305-mm)** cut-away corner section of woven-rod-mesh assembly, constructed of specified framing and woven-rod panel, showing fabrication techniques and workmanship.
3. Include one full-size security grille and vent unit.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified **[Installer][manufacturer][and][testing agency]**.
- B. Welding certificates.
- C. Material Certificates: For tool-resisting steel indicating compliance with the performance requirements

for complete test sequence in accordance with applicable ASTM standard.

- D. Material Test Reports: For tool-resisting steel, by a qualified testing agency.
- E. Mill Certificates: For tool-resisting-steel rods used in woven-rod mesh assemblies, certifying that rods were fabricated from material with same chemical and physical properties as material used to fabricate tool-resisting-steel round bars.
- F. Examination reports documenting inspections of substrates, areas, and conditions.
- G. Anchor-inspection reports documenting inspections of built-in and cast-in anchors.
- H. Field quality-control reports documenting inspections of installed products.
 - 1. Field quality-control certification signed by Contractor[**and Detention Specialist**].

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For doors in detention enclosures to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
 - 2. Tools: Provide **[two]**<Insert number> sets of tools for installing and removing security fasteners.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with detention enclosures by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer

recycled content not less than [25]<Insert value> percent.

- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

2.2 BAR-GRILLE ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[American Jail Products L.L.C.]**
 - 2. **[C.M. Security Group Inc.]**
 - 3. **[Detention Device Systems (DDS); DDS Group]**
 - 4. **[G-S Company (The)]**
 - 5. **[Kenco Wire & Iron Products Inc.]**
 - 6. **[Maximum Security Products Corp]**
 - 7. **[Peterson Detention Inc. (PDI)]**
 - 8. **[PSI LLC]**
 - 9. **[Sweeper Metal Fabricators Corp]**
 - 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[American Jail Products L.L.C.]**
 - 2. **[C.M. Security Group Inc.]**
 - 3. **[Detention Device Systems (DDS); DDS Group]**
 - 4. **[G-S Company (The)]**
 - 5. **[Kenco Wire & Iron Products Inc.]**
 - 6. **[Maximum Security Products Corp]**
 - 7. **[Peterson Detention Inc. (PDI)]**
 - 8. **[PSI LLC]**
 - 9. **[Sweeper Metal Fabricators Corp]**
 - 10. **<Insert manufacturer's name>**
- C. Tool-Resisting-Steel Bar Grilles, ASTM A627:

1. Grade 1:
 - a. Vertical Bars: **1-inch- (25.4-mm-)** diameter, [**double-ribbed, round**][**hexagonal**] composite tool-resisting-steel bars at [**4 inches (102 mm)**][**5 inches (127 mm)**][**6 inches (152 mm)**] o.c.
 - b. Horizontal Flat Bars: **3/8-by-2-1/2-inch (9.6-by-63.5-mm)** composite tool-resisting-steel flat bars at [**12 inches (305 mm)**][**18 inches (457 mm)**] o.c.
 - c. Perimeter Framing: **3/8-by-2-1/2-inch (9.6-by-63.5-mm)** composite tool-resisting-steel flat bars.
2. Grade 2:
 - a. Vertical Bars: **1-inch- (25.4-mm-)** diameter, [**double-ribbed, round**][**hexagonal**] composite tool-resisting-steel bars at [**4 inches (102 mm)**][**5 inches (127 mm)**][**6 inches (152 mm)**] o.c.
 - b. Horizontal Flat Bars: **3/8-by-2-1/2-inch (9.6-by-63.5-mm)** composite tool-resisting-steel flat bars at [**12 inches (305 mm)**][**18 inches (457 mm)**] o.c.
 - c. Perimeter Framing: **3/8-by-2-1/2-inch (9.6-by-63.5-mm)** composite tool-resisting-steel flat bars.
3. Grade 3:
 - a. Vertical Bars: **1-inch- (25.4-mm-)** diameter, [**double-ribbed, round**][**hexagonal**] homogeneous tool-resisting-steel bars at [**4 inches (102 mm)**][**5 inches (127 mm)**][**6 inches (152 mm)**] o.c.
 - b. Horizontal Flat Bars: **5/16-by-2-1/4-inch (7.9-by-57.2-mm)** homogeneous tool-resisting-steel flat bars at [**12 inches (305 mm)**][**18 inches (457 mm)**] o.c.
 - c. Perimeter Framing: **5/16-by-2-1/4-inch (7.9-by-57.2-mm)** homogeneous tool-resisting-steel flat bars.
4. Grade 4:
 - a. Vertical Bars: **7/8-inch- (22.2-mm-)** diameter, [**double-ribbed, round**][**hexagonal**] homogeneous tool-resisting-steel bars at [**4 inches (102 mm)**][**5 inches (127 mm)**][**6 inches (152 mm)**] o.c.
 - b. Horizontal Flat Bars: **1/4-by-2-inch (6.4-by-50.8-mm)** homogeneous tool-resisting-steel flat bars at [**12 inches (305 mm)**][**18 inches (457 mm)**] o.c.
 - c. Perimeter Framing: **1/4-by-2-inch (6.4-by-50.8-mm)** homogeneous tool-resisting-steel flat bars.
- D. Mild-Steel Bar Grilles:
 1. Vertical Bars: **7/8-inch- (22.2-mm-)** diameter, [**double-ribbed, round**][**hexagonal**], mild-steel bars at [**4 inches (102 mm)**][**5 inches (127 mm)**][**6 inches (152 mm)**] o.c.
 2. Horizontal Flat Bars: **3/8-by-2-1/4-inch (9.5-by-57-mm)** mild-steel flat bars at [**12 inches (305 mm)**][**18 inches (457 mm)**] o.c.
 3. Perimeter Framing: **3/8-by-2-1/4-inch (9.5-by-57-mm)** mild-steel flat bars.
- E. Materials:
 1. Tool-Resisting-Steel Round and Flat Bars: ASTM A627.
 2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- F. Finishes:
 1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

2.3 WOVEN-ROD-MESH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[American Jail Products L.L.C.]**
 2. **[Detention Device Systems (DDS); DDS Group]**
 3. **[G-S Company (The)]**
 4. **[Kane Innovations, Inc.]**
 5. **[Kenco Wire & Iron Products Inc.]**
 6. **[Maximum Security Products Corp]**
 7. **[Peterson Detention Inc. (PDI)]**
 8. **[PSI LLC]**
 9. **[Sierra Detention Systems]**
 10. **[Sweeper Metal Fabricators Corp]**
 11. **[Trussbilt, LLC]**
 12. **[Unified Screening and Crushing]**
 13. **[Willo Products Company, Inc.]**
 14. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[American Jail Products L.L.C.]**
 2. **[Detention Device Systems (DDS); DDS Group]**
 3. **[G-S Company (The)]**
 4. **[Kane Innovations, Inc.]**
 5. **[Kenco Wire & Iron Products Inc.]**
 6. **[Maximum Security Products Corp]**
 7. **[Peterson Detention Inc. (PDI)]**
 8. **[PSI LLC]**
 9. **[Sierra Detention Systems]**
 10. **[Sweeper Metal Fabricators Corp]**
 11. **[Trussbilt, LLC]**
 12. **[Unified Screening and Crushing]**
 13. **[Willo Products Company, Inc.]**
 14. **<Insert manufacturer's name>**
- C. Main Framing: Formed from **1-1/2-by-2-1/2-inch (38-by-63.5-mm)** built-up tubular steel consisting of an open channel with fixed concealment plates.
1. Open Channel: Formed from **[0.134-inch (3.42-mm)][0.105-inch (2.66-mm)]** nominal-thickness steel sheet or channel with individual slots along inner edges to support woven-rod panels.
 2. Concealment Plates: Steel sheet, nominal thickness to match open channel.
- D. Supplementary Framing: Formed from **2-inch-square by 3/16-inch- (51-mm-square by 4.8-mm)** thick steel tubing.
- E. Braces: Formed from same material as main framing.
- F. Woven-Rod Panels: Formed from double crimped, **[1/4-inch- (6-mm-)][3/8-inch- (9.5-mm-)]** diameter steel rod, woven horizontally and vertically into a rigid grille with rods at **2 inches (51 mm)** o.c.
1. Steel Rod: **[Mild][Homogeneous tool-resisting]** steel.

- G. Floor Anchor Clips: **2-by-2-by-3/16-inch (51-by-51-by-4.8-mm)** mild-steel angles for straight framing; **1-1/2-by-1-1/2-by-3/16-inch (38-by-38-by-4.8-mm)** mild-steel angles for corners.
- H. Floor Anchors: **2-inch-square by 3/16-inch- (51-mm-square by 4.8-mm-)** thick, mild-steel tubing sleeve welded to **6-inch-square by 3/16-inch- (152-mm-square by 4.8-mm-)** thick, mild-steel plate.
- I. Wall and Ceiling Anchors and Trim: Continuous **2-by-2-by-3/16-inch (51-by-51-by-4.8-mm)** mild-steel angle with **2-by-3/16-inch (51-by-4.8-mm)** mild-steel flat bar.
- J. Materials:
1. Tool-Resisting-Steel Round Rods: Rods fabricated from material with same chemical and physical properties as tool-resisting-steel round bars.
 2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 3. Steel Sheet: Cold-rolled ASTM A1008/A1008M or hot-rolled ASTM A1011/A1011M, CS (Commercial Steel), Type B; suitable for exposed applications.
 4. Steel Tubing: ASTM A501/A501M or ASTM A513/A513M, Type B unless otherwise indicated.
- K. Finishes:
1. Interior Locations:
 - a. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - b. Galvanized-Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - c. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 - d. Galvanized-Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 2. Exterior Locations:
 - a. Galvanized-Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - b. Galvanized-Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1) Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.4 SECURITY GRILLES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[American Jail Products L.L.C.]**
 2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
 3. **[Maximum Security Products Corp]**
 4. **[Peterson Detention Inc. (PDI)]**
 5. **[Price Industries Limited]**
 6. **[SafetyConcepts]**
 7. **[Sweeper Metal Fabricators Corp]**
 8. **[Titus; brand of Johnson Controls International plc, Global Products]**
 9. **[Trussbilt, LLC]**
 10. **[Willo Products Company, Inc.]**
 11. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[American Jail Products L.L.C.]**
 2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
 3. **[Maximum Security Products Corp]**
 4. **[Peterson Detention Inc. (PDI)]**
 5. **[Price Industries Limited]**
 6. **[SafetyConcepts]**
 7. **[Sweeper Metal Fabricators Corp]**
 8. **[Titus; brand of Johnson Controls International plc, Global Products]**
 9. **[Trussbilt, LLC]**
 10. **[Willo Products Company, Inc.]**
 11. **<Insert manufacturer's name>**
- C. Wire Mesh: **0.135-inch- (3.5-mm-)** diameter steel wire woven into a **3/8-inch (9.5-mm)** mesh attached to perimeter sleeve by **[bolts or studs][welding]**.
- D. Perimeter Sleeve: **3/16-inch- (4.8-mm-)** thick, mild-steel flat bar frame with **[anchor studs][masonry anchors][angle mounting frames]**.
- E. Vertical Bars: **[7/8-inch- (22-mm-)][1-inch- (25-mm-)]** diameter, **[double-ribbed, round][hexagonal], [mild-steel][homogeneous tool-resisting-steel]** bars at **4 inches (102 mm)** o.c.
- F. Flat Bar Interior Frame: **2-1/2-by-3/8-inch- (63.5-by-9.5-mm-)** thick, **[mild-steel][homogeneous tool-resisting-steel]** flat bars.
- G. Horizontal Flat Bars: **2-1/2-by-3/8-inch- (63.5-by-9.5-mm-)** thick, **[mild-steel][homogeneous tool-resisting-steel]** flat bars **12 inches (305 mm)** o.c.
- H. Materials:
1. Tool-Resisting-Steel Round and Flat Bars: ASTM A627.
 2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- I. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.5 PERFORATED-PLATE SECURITY VENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[American Jail Products L.L.C.]**
 2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
 3. **[Maximum Security Products Corp]**
 4. **[Peterson Detention Inc. (PDI)]**
 5. **[Price Industries Limited]**
 6. **[SafetyConcepts]**
 7. **[Sweeper Metal Fabricators Corp]**
 8. **[Titus; brand of Johnson Controls International plc, Global Products]**
 9. **[Trussbilt, LLC]**
 10. **[Willo Products Company, Inc.]**
 11. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[American Jail Products L.L.C.]**
 2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
 3. **[Maximum Security Products Corp]**
 4. **[Peterson Detention Inc. (PDI)]**
 5. **[Price Industries Limited]**
 6. **[SafetyConcepts]**
 7. **[Sweeper Metal Fabricators Corp]**
 8. **[Titus; brand of Johnson Controls International plc, Global Products]**
 9. **[Trussbilt, LLC]**
 10. **[Willo Products Company, Inc.]**
 11. **<Insert manufacturer's name>**
- C. Faceplate: **3/16-inch- (4.8-mm-)** thick, **[mild-steel][stainless steel]** plate; with **5/16-inch (7.9-mm)** round holes staggered **7/16 inch (11 mm)** o.c. in each direction.
- D. Opening Sleeve: **3/16-inch- (4.8-mm-)** thick steel plate welded to faceplate.
- E. Perimeter Frame: **1-by-1-by-3/16-inch- (25-by-25-by-4.8-mm-)** thick, mild-steel angles.
- F. Provide anchor studs welded to back of faceplate for installation into concrete.
- G. Provide masonry anchors welded to sleeve for installation into masonry.
- H. Damper: **[Front][Rear]**-operated, opposed-blade type.

I. Materials:

1. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.

J. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
3. Stainless Steel Finishes:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 4.
 - c. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

2.6 PERFORATED-PLATE SECURITY VENTS WITH WIRE MESH

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
3. **[Maximum Security Products Corp]**
4. **[Peterson Detention Inc. (PDI)]**
5. **[Price Industries Limited]**
6. **[SafetyConcepts]**
7. **[Sweeper Metal Fabricators Corp]**
8. **[Titus; brand of Johnson Controls International plc, Global Products]**
9. **[Trussbilt, LLC]**
10. **[Willo Products Company, Inc.]**
11. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**

3. [Maximum Security Products Corp]
 4. [Peterson Detention Inc. (PDI)]
 5. [Price Industries Limited]
 6. [SafetyConcepts]
 7. [Sweeper Metal Fabricators Corp]
 8. [Titus; brand of Johnson Controls International plc, Global Products]
 9. [Trussbilt, LLC]
 10. [Willo Products Company, Inc.]
 11. <Insert manufacturer's name>
- C. Faceplate: **[0.075-inch (1.90-mm) nominal-thickness, mild-steel][0.078-inch- (1.98-mm-) thick, stainless steel]** sheet; with **3/4-inch- (19-mm-)** square perforations **1/4 inch (6 mm)** apart in each direction.
- D. Wire Mesh: **0.062-inch- (1.6-mm-)** diameter steel wire woven into a **1/4-inch (6-mm)** mesh, welded to opening sleeve behind faceplate.
- E. Opening Sleeve: **0.075-inch (1.90-mm)** nominal thickness, formed from steel sheet and welded to faceplate.
- F. Perimeter Frame: **1-by-1-by-3/16-inch- (25-by-25-by-4.8-mm-)** thick, mild-steel angles.
- G. Provide anchor studs welded to back of faceplate for installation into concrete.
- H. Provide masonry anchors welded to sleeve for installation into masonry.
- I. Damper: **[Front][Rear]**-operated, opposed-blade type.
- J. Materials:
1. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
 2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- K. Finishes:
1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 3. Stainless Steel Finishes:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 4.

- c. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

2.7 PERFORATED-PLATE SECURITY VENTS WITH BACKUP PLATE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
3. **[Maximum Security Products Corp]**
4. **[Peterson Detention Inc. (PDI)]**
5. **[Price Industries Limited]**
6. **[SafetyConcepts]**
7. **[Sweeper Metal Fabricators Corp]**
8. **[Titus; brand of Johnson Controls International plc, Global Products]**
9. **[Trussbilt, LLC]**
10. **[Willo Products Company, Inc.]**
11. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
3. **[Maximum Security Products Corp]**
4. **[Peterson Detention Inc. (PDI)]**
5. **[Price Industries Limited]**
6. **[SafetyConcepts]**
7. **[Sweeper Metal Fabricators Corp]**
8. **[Titus; brand of Johnson Controls International plc, Global Products]**
9. **[Trussbilt, LLC]**
10. **[Willo Products Company, Inc.]**
11. **<Insert manufacturer's name>**

- C. Faceplate: **3/16-inch- (4.8-mm-)** thick, **[mild-steel][stainless steel]** plate; with **2-inch- (51-mm-)** square perforations **1 inch (25 mm)** apart in each direction.
- D. Wire Mesh: **0.135-inch- (3.5-mm-)** diameter steel wire woven into a **3/8-inch (9.5-mm)** mesh, secured between faceplate and backup plate.
- E. Backup Plate: **1/4-inch- (6-mm-)** thick, mild-steel plate with perforations matching faceplate.
- F. Perimeter Frame: **1-by-1-by-3/16-inch- (25-by-25-by-4.8-mm-)** thick, mild-steel angles.
- G. Opening Sleeve: **3/16-inch- (4.8-mm-)** thick steel plate welded to faceplate.
- H. Provide anchor studs welded to back of faceplate for installation into concrete.
- I. Provide masonry anchors welded to sleeve for installation into masonry.
- J. Damper: **[Front][Rear]**-operated, opposed-blade type.
- K. Materials:

1. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.

L. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
3. Stainless Steel Finishes:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: No. 4.
 - c. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

2.8 TOOL-RESISTING-STEEL, PERFORATED-PLATE SECURITY VENTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
3. **[Maximum Security Products Corp]**
4. **[Peterson Detention Inc. (PDI)]**
5. **[Price Industries Limited]**
6. **[SafetyConcepts]**
7. **[Sweeper Metal Fabricators Corp]**
8. **[Titus; brand of Johnson Controls International plc, Global Products]**
9. **[Trussbilt, LLC]**
10. **[Willo Products Company, Inc.]**
11. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[American Jail Products L.L.C.]**
2. **[Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.]**
3. **[Maximum Security Products Corp]**
4. **[Peterson Detention Inc. (PDI)]**
5. **[Price Industries Limited]**

6. [SafetyConcepts]
7. [Sweeper Metal Fabricators Corp]
8. [Titus; brand of Johnson Controls International plc, Global Products]
9. [Trussbilt, LLC]
10. [Willo Products Company, Inc.]
11. <Insert manufacturer's name>

- C. Faceplate: **1/4-inch- (6-mm-)** thick, homogeneous tool-resisting-steel plate; with **2-inch- (51-mm-)** square perforations **1 inch (25 mm)** apart in each direction.
- D. Wire Mesh: **0.135-inch- (3.5-mm-)** diameter steel wire woven into a **3/8-inch (9.5-mm)** mesh, attached to faceplate by bolts or studs.
- E. Backup Plate: **1/4-inch- (6-mm-)** thick, homogeneous tool-resisting-steel plate with perforations matching faceplate.
- F. Perimeter Frame: **3/16-inch- (4.8-mm-)** thick, mild-steel flat bar with **[anchor studs][masonry anchors][angle mounting frames]**.
- G. Materials:
 1. Tool-Resisting-Steel Round and Flat Bars: ASTM A627.
 2. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- H. Finishes:
 1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.9 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to **[four]<Insert safety factor>** times the load imposed, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below.
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hot-dip galvanized in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
- C. Embedded Plate Anchors: Fabricated from mild-steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- D. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy

welded.

2.10 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of detention enclosures with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Form and grind edges and corners to be free of sharp edges or rough areas.
- E. Form metal in maximum lengths to minimize joints. Form sheet-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- F. Weld corners and seams continuously to comply with referenced AWS standard and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention enclosures rigidly in place and to support indicated loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- H. Cut, reinforce, drill, and tap detention enclosures as indicated to receive hardware, security fasteners, and similar items.
- I. Form exposed work true to line and level with accurate angles, surfaces, and straight sharp edges.
- J. Form exposed connections with hairline joints flush and smooth using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security screws. Locate joints where least conspicuous.
- K. Exterior Detention Enclosures: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): [120 deg F (67 deg C), ambient; 180 deg F (100 deg C)]<Insert **temperature range**>, material surfaces.

2.11 FABRICATION OF BAR-GRILLE ASSEMBLIES

- A. Fabricate bar-grille assemblies with materials and to sizes and configurations indicated, complete with mounting flanges and anchors.
1. Pass vertical round bars through, and positively interlock them with, horizontal flat bars at each intersection without reducing circumference of round bars at these intersections and without using pipe sleeves, swedging, calking, or interlocks that depend on friction. **[Weld vertical round bars at each intersection with flat bars on both top and underside of flat bar.]**
 2. Pass ends of round bars at least **1 inch (25 mm)** through framing, and weld bars to framing from back side of framing.
 3. Fabricate cutouts and openings in bar-grille assemblies for penetrations of sizes and at locations indicated. Frame openings with flat bars of same material and size as horizontal flat bars.
 4. Frame connections with plates; use flat bars of same material and size as horizontal flat bars.
- B. Partitions: Connect top horizontal flat bar to vertical flat bar framing members with **2-by-2-by-1/4-inch- (51-by-51-by-6-mm-)** thick, steel plate angle knee welded into place. Connect intersections of horizontal flat bars with vertical flat bar framing members by **3/16-inch (4.8-mm)** fillet welds. Weld vertical bars securely to top and bottom flat bar framing members.
- C. Doors: Fabricate **[swinging][sliding]** doors of same type bar-grille assembly as bar-grille partition in which they are installed. Weld lockbox at lock jamb of door, fabricated of steel plate to match horizontal flat bars. Comply with requirements in Section 119814 "Detention Door Hardware" for detention hinges and detention locks and latches.
1. Food-Pass Openings: Frame top and sides of opening with flat bar of same quality and size as horizontal flat bars. Weld **1/4-inch- (6-mm-)** thick steel plate shelf, of same quality as horizontal flat bars, at bottom of opening.

2.12 FABRICATION OF WOVEN-ROD-MESH ASSEMBLIES

- A. Main Framing: Before inserting woven-rod panels, weld and grind smooth corners of open channel elements. **[Fabricate partitions taller than 12 feet (3.6 m) from multiple panels stacked on top of one another.]**
- B. Woven-Rod Panels: Insert panels symmetrically in main framing. Extend end of each rod at least **1 inch (25 mm)** into main framing and, from inside of channel, weld into each slot where it contacts main framing.
- C. Concealment Plates: Weld plates to main framing with minimum **1 inch (25 mm)** welds at minimum **10 inches (254 mm)** o.c., staggered side to side and ground smooth, to form a fully enclosed tubular steel frame.
- D. Anchor Clips: For each enclosure panel, weld one anchor clip to secure side of main framing in line with vertical framing.
- E. Swinging Doors: Fabricate doors with framing on four sides of door from same material as adjacent panels and with **2-by-1/4-inch (51-by-6-mm)** flat steel bar astragal continuous on lock jamb. Align bottom of door with bottom of adjacent panels. Comply with requirements in Section 119814 "Detention Door Hardware" for detention hinges and detention locks and latches.
- F. Sliding Doors: Fabricate doors with framing on four sides of door from same material as adjacent panels. Align bottom of door with bottom of adjacent panels. Comply with requirements in Section 119814 "Detention Door Hardware" for sliding detention door device assemblies and detention locks

and latches.

- G. Hardware Preparation: Mortise, reinforce, drill, and tap doors and main framings for templated hardware to comply with approved Door Hardware Schedule. Frame openings to receive detention door locks.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water, and provide weep holes where water may accumulate.

2.13 FABRICATION OF SECURITY GRILLES AND VENTS

- A. Fabricate security grilles and vents with materials and to sizes and configurations indicated, complete with mounting flanges and anchors.
- B. Security Grilles:
 - 1. Orient axis of ribs of each double-ribbed round bar to run parallel to airflow.
 - 2. Pass vertical round bars through, and positively interlock them with, horizontal flat bars at each intersection without reducing circumference of round bars at these intersections and without using pipe sleeves, swedging, calking, or interlocks that depend on friction. Weld horizontal flat bars to perimeter sleeve. **[Weld vertical round bars at each intersection with flat bars on top side of flat bar.]**
 - 3. Pass ends of round bars through flat bars **[and weld to flat bars]**.
 - 4. Weld flat bar interior frame along perimeter sleeve.
 - 5. Weld one angle mounting frame to perimeter sleeve. Leave other angle mounting frame loose for field installation.
- C. Where bolts are used to secure wire mesh, once secured, batter threads to prevent nut removal.

2.14 SECURITY FASTENERS

- A. Security Fasteners: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**

- e. [Tamperproof Screw Co., Inc.]
- f. <Insert manufacturer's name>
- 3. Drive-System Type: [Pinned Torx-Plus][Pinned Torx]<Insert system>.
- 4. Fastener Strength: 120,000 psi (827 MPa).
- 5. Socket Button Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835 (ASTM F835M).
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
- 6. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835 (ASTM F835M).
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
- 7. Socket Head Cap Fasteners:
 - a. Heat-treated alloy steel, ASTM A574 (ASTM A574M).
 - b. Stainless steel, ASTM F837 (ASTM F837M), Group 1 CW.
- 8. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention enclosures.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention enclosure connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention enclosures.
- D. Inspect built-in and cast-in anchor installations, before installing detention enclosures, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Inspect proprietary built-in masonry anchors to verify that anchor installations comply with requirements in Section 042000 "Unit Masonry."
- F. Verify locations of detention enclosures with those indicated on Shop Drawings.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install detention enclosures plumb, rigid, properly aligned, and securely fastened in place, complying with manufacturer's written recommendations.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention enclosures to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
- C. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention enclosures. Set detention enclosures accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into adjacent construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.3 INSTALLATION OF BAR-GRILLE ASSEMBLIES

- A. Wall and Ceiling Anchorage: Weld framing to continuous angles with continuous welds. Anchor angles to embedded anchors by **[bolting][welding]**.
- B. Partitions: Weld adjacent framing members to each other with continuous **1/4-inch- (6-mm-)** deep welds on both sides; grind smooth.
- C. Doors: Install **2 inches (51 mm)** above finish floor. Adjust to operate easily without binding.

3.4 INSTALLATION OF WOVEN-ROD-MESH ASSEMBLIES

- A. Floor Anchorage: Fasten anchor clips to floor with **3/8-inch- (9.5-mm-)** diameter bolts with double-expansion shields.
- B. Wall and Ceiling Anchorage: Anchor continuous angle to walls and ceilings with **3/8-inch- (9.5-mm-)** diameter, **[security-type, double-expansion anchor bolts with "break-off" heads][toggle bolts; weld bolt heads to angle]**.
 - 1. Weld main framing to wall and ceiling angles with **1-inch (25-mm)** welds at **12 inches (305 mm)** o.c.

- C. Weld adjacent main framing members to each other with **1/4-inch-deep by 3/4-inch- (6-mm- by 19-mm-)** long welds at **12 inches (305 mm)** o.c. on both sides of framing.
- D. Provide supplementary framing at **[three-way connections][and][multiple-panel-height partitions]**. Weld main framing to supplementary framing with **1/8-inch (3-mm)** fillet welds **1 inch (25 mm)** long at **12 inches (305 mm)** o.c. on both sides of framing.
- E. Provide additional field bracing as shown or as necessary for rigid, secure installation.
- F. Adjust doors to operate easily without binding.

3.5 INSTALLATION OF SECURITY GRILLES AND VENTS

- A. Locations: Unless otherwise indicated, install security grilles and vents in penetrations and openings with dimensions exceeding **[8 inches (203 mm)]<Insert dimension>** in **[either direction][diameter]**.
- B. Support Frames: Set support frames in adjacent construction.
- C. Field weld angle mounting frame in place from back side.
- D. Field weld perimeter frames to duct sleeves.

3.6 FIELD QUALITY CONTROL

- A. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace detention work if inspections indicate that work does not comply with specified requirements. Remove malfunctioning units; replace with new units.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification[**endorsed by Detention Specialist**] that states installed products comply with requirements in the Contract Documents.

3.7 CLEANING AND PROTECTION

- A. Touchup Painting:
 - 1. Immediately after erection, clean bolted connections and abraded areas of shop paint, and paint exposed areas with same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 2. Cleaning and touchup painting of bolted connections and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas; repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 11 98 12 00

SECTION 11 98 12 00A - DETENTION DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Detention door and frame assemblies.

B. Related Requirements:

1. Section 055963 "Detention Enclosures" for **[bar-grille assemblies][and][woven-rod-mesh assemblies]** incorporating doors for detention applications.
2. Section 119814 "Detention Door Hardware" for door hardware for detention doors.

1.2 DEFINITIONS

- A. Minimum-Thickness Steel: Indicated as the specified minimum thicknesses for base metal without coatings, in accordance with NAAMM-HMMA 803.
- B. Nominal-Thickness Stainless Steel: Indicated as the specified thicknesses for which over- and under-thickness tolerances apply, in accordance with ASTM A480/A480M.

1.3 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B. Coordinate installation of anchorages for detention frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference **[at Project site][by web conference]<Insert location>**.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, label compliance, **[fire-resistance rating,][temperature-rise ratings,]** and finishes for each detention door and frame type specified.

- B. Shop Drawings: In addition to requirements below, provide a schedule using same reference numbers for details and openings as those on Drawings:
1. Elevations of each door type.
 2. Direction of **[swing][slide]**.
 3. Inmate and non-inmate sides.
 4. Details of doors, including vertical and horizontal edge details, and metal thicknesses.
 5. Details of frames, including dimensioned profiles, and metal thicknesses.
 6. Locations of reinforcement and preparations for hardware.
 7. Details of each different wall opening condition.
 8. Details of anchorages, joints, field splices, and connections.
 9. Details of **[food-pass openings][louvers][speaking apertures][and][gun ports]**.
 10. Details of moldings, removable stops, and glazing.
 11. Details of conduits, junction boxes, and preparations for **[electrically operated][and][pneumatic]** door hardware.
 12. **<Insert requirements>**.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.
- D. Samples for Verification: Actual sample of finished products for each type of detention door and frame assembly to demonstrate compliance with requirements for quality of materials and constructions.
1. Size: **[Manufacturers' standard size][12 by 12 inches (305 by 305 mm)]<Insert size>**.
 2. Detention Doors: Show vertical-edge, top, and bottom construction; insulation; face stiffeners; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 3. Detention Frames: Show profile, welded corner joint, welded hinge reinforcement, grout-cover boxes, floor and wall anchors, and silencers. Include separate section showing fixed steel panels and glazing if applicable.
- E. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
 2. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 3. Environmental Product Declaration (EPD): For each product.
 4. Health Product Declaration (HPD): For each product.
 5. Environmental Product Declaration (EPD): For each product.
 6. Health Product Declaration (HPD): For each product.
 7. Environmental Product Declaration (EPD): For each product.
 8. Environmental Product Declaration (EPD): For each product.
 9. Environmental Product Declaration (EPD): For each product.
 10. Third-Party Certifications: For each product.
 11. Third-Party-Certified Life-Cycle Assessment: For each product.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Test Reports: For each type of detention door and frame assembly including vision and side lights, for tests performed by **[a qualified testing agency][manufacturer and witnessed by a**

qualified testing agency].

- C. Examination Reports: For inspection of substrates, areas, and conditions.
- D. Anchor Inspection Reports: For inspections of built-in and cast-in anchors.
- E. Field Quality Control Reports: For inspections of installed products.
 - 1. Field quality control certification, signed by Contractor[**and Detention Specialist**].
- F. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- G. Qualification Statements: For Installer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
 - 2. Tools: Provide **[two]<Insert number>** sets of tools for installing and removing security fasteners.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.3/D1.3M.
 - 3. AWS D1.6/D1.6M.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver detention hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver detention frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store detention hollow-metal work vertically under cover at Project site with head up. Place on minimum **4-inch- (102-mm-)** high wood blocking. Provide minimum **1/4-inch (6.3-mm)** space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain detention doors and frames from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[**and temperature-rise limits**] indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
 - 2. Oversize Fire-Rated Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- C. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.
- D. Detention Door and Frame Assemblies: Provide detention door and frame assemblies that comply with the following, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:
 - 1. Security Grade: Assemblies pass testing requirements in ASTM F1450 for security grades specified.
 - 2. Bullet Resistance: UL-HG-C rated when tested in accordance with UL 752.
 - 3. Tool-Attack Resistance: Small-tool-attack-resistance rated when tested in accordance with UL 437 and UL 1034.
- E. Detention Frames: Provide sidelight and borrowed-light detention frames that comply with ASTM F1592 and removable stop test in accordance with ANSI/NAAMM-HMMA 863, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

2.3 DETENTION DOOR AND FRAME ASSEMBLIES

- A. Detention Door and Frame Assemblies:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[AMBICO Limited]**
 - b. **[Ceco Door; AADG, Inc.; ASSA ABLOY]**

- c. [Habersham Metal Products Company]
 - d. [Pioneer Industries; AADG, Inc.; ASSA ABLOY]
 - e. [Sweeper Metal Fabricators Corp]
 - f. [Titan Metal Products]
 - g. [Trussbilt, LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [AMBICO Limited]
 - b. [Ceco Door; AADG, Inc.; ASSA ABLOY]
 - c. [Habersham Metal Products Company]
 - d. [Pioneer Industries; AADG, Inc.; ASSA ABLOY]
 - e. [Sweeper Metal Fabricators Corp]
 - f. [Titan Metal Products]
 - g. [Trussbilt, LLC]
 - h. <Insert manufacturer's name>

2.4 DETENTION DOORS

- A. General: Provide flush-design detention doors of seamless hollow construction, **2 inches (51 mm)** thick unless otherwise indicated. Construct detention doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges.
 - 1. For single-acting swinging detention doors, bevel both vertical edges **1/8 inch in 2 inches (3 mm in 51 mm)**.
 - 2. For sliding detention doors, square both vertical edges.
- B. Core Construction: Provide the following core construction of same material as detention door face sheets, welded to both detention door faces:
 - 1. Steel-Stiffened Core: **0.042-inch- (1.0-mm-)** thick, steel vertical stiffeners extending full-door height; with vertical webs spaced not more than **4 inches (102 mm)** apart; spot welded to face sheets at not more than **3 inches (76 mm)** o.c. Fill spaces between stiffeners with insulation.
 - 2. Truss-Stiffened Core: **0.013-inch- (0.3-mm-)** thick, steel, truncated triangular stiffeners extending between face sheets and for full height and width of door; with stiffeners welded to face sheets at not more than **3 inches (76 mm)** o.c. vertically and **2-3/4 inches (70 mm)** horizontally. Fill spaces between stiffeners with insulation.
- C. Vertical Edge Channels: **0.123-inch- (3.1-mm-)** thick, continuous channel of same material as detention door face sheets, extending full-door height at each vertical edge; welded to top and bottom channels to create a fully welded perimeter channel. Noncontiguous channel is permitted to accommodate lock-edge hardware only if lock reinforcement is welded to and made integral with channel.
- D. Top and Bottom Channels: **0.123-inch- (3.1-mm-)** thick, metal channel of same material as detention door face sheets; spot welded to face sheets at not more than **4 inches (102 mm)** o.c.
 - 1. Reinforce top edge of detention door with **0.053-inch- (1.3-mm-)** thick, closing channel; welded so channel web is flush with top door edges.
- E. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention door face sheets to comply with the following minimum thicknesses:

1. Full-Mortise Hinges and Pivots: **0.167 inch (4.2 mm)** thick.
2. Maximum-Security Surface Hinges: **0.214 inch (5.4 mm)** thick.
3. Strike Reinforcements: **0.167 inch (4.2 mm)** thick.
4. Slide-Device Hanger Attachments: As recommended in writing by device manufacturer.
5. Lock Fronts, Concealed Holders, and Surface-Mounted Closers: **0.093 inch (2.3 mm)** thick.
6. All Other Surface-Mounted Hardware: **0.093 inch (2.3 mm)** thick.
7. Lock Pockets: **0.123 inch (3.1 mm)** thick at non-inmate side; welded to face sheet.

F. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware of same material as detention door face sheets; interconnected with UL-approved, **1/2-inch- (12.7-mm-)** diameter conduit and connectors.

1. Access Plates: Where indicated for wiring installation, provide access plates to junction boxes; fabricated from same material and thickness as face sheet and fastened with at least four security fasteners spaced not more than **6 inches (152 mm)** o.c.

G. Interior Detention Doors: Construct interior doors to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in ANSI/NAAMM-HMMA 863 and as specified.

1. Security Grade 1: Provide doors with face sheets of [**0.093-inch- (2.3-mm-) minimum-thickness, cold-rolled steel**][**0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.109-inch (2.8-mm) nominal-thickness stainless steel**].
2. Security Grade 2: Provide doors with face sheets of [**0.093-inch- (2.3-mm-) minimum-thickness, cold-rolled steel**][**0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.109-inch (2.8-mm) nominal-thickness stainless steel**].
3. Security Grade 3: Provide doors with face sheets of [**0.067-inch- (1.7-mm-) minimum-thickness, cold-rolled steel**][**0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled, steel**][**0.078-inch (2.0-mm) nominal-thickness stainless steel**].
4. Security Grade 4: Provide doors with face sheets of [**0.067-inch- (1.7-mm-) minimum-thickness, cold-rolled steel**][**0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.078-inch (2.0-mm) nominal-thickness stainless steel**].

H. Exterior Detention Doors: Construct exterior doors to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in ANSI/NAAMM-HMMA 863 and as specified.

1. Security Grade 1: Provide doors with face sheets of [**0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.109-inch (2.8-mm) nominal-thickness stainless steel**].
2. Security Grade 2: Provide doors with face sheets of [**0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.109-inch (2.8-mm) nominal-thickness stainless steel**].
3. Security Grade 3: Provide doors with face sheets of [**0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.078-inch (2.0-mm) nominal-thickness stainless steel**].
4. Security Grade 4: Provide doors with face sheets of [**0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel**][**0.078-inch (2.0-mm) nominal-thickness stainless steel**].

2.5 DETENTION FRAMES

A. General: Provide fully welded detention frames with integral stops, of seamless construction without visible joints or seams. Fabricate detention frames with contact edges closed tight and corners mitered,

reinforced, and continuously welded full depth and width of detention frame.

- B. Stop Height: Provide minimum stop height of **[0.625 inch (15.8 mm)][0.750 inch (19 mm)]** for detention door openings and minimum stop height of **1-1/4 inches (32 mm)** in security glazing or detention panel openings unless otherwise indicated.
- C. Interior Detention Frames: Construct interior frames to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in ANSI/NAAMM-HMMA 863 and as specified.
 - 1. Security Grade 1: Provide frames fabricated from **[0.093-inch- (2.3-mm-) minimum-thickness, cold-rolled steel][0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.109-inch (2.8-mm) nominal-thickness stainless steel]**.
 - 2. Security Grade 2: Provide frames fabricated from **[0.093-inch- (2.3-mm-) minimum-thickness, cold-rolled steel][0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.109-inch (2.8-mm) nominal-thickness stainless steel]**.
 - 3. Security Grade 3: Provide frames fabricated from **[0.067-inch- (1.7-mm-) minimum-thickness, cold-rolled steel][0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.078-inch (2.0-mm) nominal-thickness stainless steel]**.
 - 4. Security Grade 4: Provide frames fabricated from **[0.067-inch- (1.7-mm-) minimum-thickness, cold-rolled steel][0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.078-inch (2.0-mm) nominal-thickness stainless steel]**.
- D. Exterior Detention Frames: Construct exterior frames to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in ANSI/NAAMM-HMMA 863 and as specified.
 - 1. Security Grade 1: Provide frames fabricated from **[0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.109-inch (2.8-mm) nominal-thickness stainless steel]**.
 - 2. Security Grade 2: Provide frames fabricated from **[0.093-inch- (2.3-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.109-inch (2.8-mm) nominal-thickness stainless steel]**.
 - 3. Security Grade 3: Provide frames fabricated from **[0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.078-inch (2.0-mm) nominal-thickness stainless steel]**.
 - 4. Security Grade 4: Provide frames fabricated from **[0.067-inch- (1.7-mm-) minimum-thickness, metallic-coated, cold-rolled steel][0.078-inch (2.0-mm) nominal-thickness stainless steel]**.
- E. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention frame to comply with the following minimum thicknesses:
 - 1. Hinges and Pivots: **0.167 inch (4.2 mm)** thick by **1-1/2 inches (38 mm)** wide by **10 inches (254 mm)** long.
 - 2. Strikes: **0.167 inch (4.2 mm)** thick.
 - 3. Flush Bolts: **0.167 inch (4.2 mm)** thick.
 - 4. Closers: **0.167 inch (4.2 mm)** thick.
 - 5. Surface-Mounted Hardware: **0.093 inch (2.3 mm)** thick.
 - 6. Lock Pockets: **0.123 inch (3.1 mm)** thick at non-inmate side; welded to face sheet. Provide **0.123-inch- (3.1-mm-) thick**, lock protection plate for attachment to lock pocket with security fasteners.
- F. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware; interconnected with UL-approved, **1/2-inch- (12.7-mm-) diameter** conduit and connectors.
 - 1. Access Plates: Where indicated for wiring installation, provide access plates to junction boxes; fabricated from same material and thickness as face sheet and fastened with at least four security fasteners spaced not more than **6 inches (152 mm)** o.c.

- G. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between detention frame members with concealed clip angles or sleeves of same metal and thickness as detention frame.
- H. Jamb Anchors: Weld jamb anchors to detention frames near hinges and directly opposite on strike jamb or as required to secure detention frames to adjacent construction.
1. Number of Anchors: Provide two anchors per jamb plus the following:
 - a. Detention Door Frames: One additional anchor for each **18 inches (457 mm)**, or fraction thereof, above **54 inches (1372 mm)** in height.
 - b. Detention Frames with Security Glazing or Detention Panels: One additional anchor for each **18 inches (457 mm)**, or fraction thereof, above **36 inches (914 mm)** in height.
 2. Masonry Anchors: Adjustable, corrugated or perforated, strap-and-stirrup anchors to suit detention frame size; formed of same material and thickness as detention frame; with strap not less than **2 inches (51 mm)** wide by **10 inches (254 mm)** long.
 3. Embedded Anchors: Provide detention frames with removable faces at jambs where embedded anchors are indicated. Anchors consist of the following three parts:
 - a. Embedded Plates: Steel plates, **0.187 inch thick by 4 inches wide by 6 inches long (4.7 mm thick by 102 mm wide by 152 mm long)**. Continuously weld two steel bars, **1/2 inch (12.7 mm)** in diameter and **10 inches (254 mm)** long with **2-inch (51-mm)** 90-degree turndown on ends, to the embedded end of each plate. Weld steel angles, **0.188 inch thick by 2 by 2 by 4 inches long (4.7 mm thick by 51 by 51 by 102 mm long)**, to the exposed end of each plate. Embed at locations to match frame angles.
 - b. Frame Angles: Steel angles, **0.187 inch thick by 2 by 2 by 4 inches long (4.7 mm thick by 51 by 51 by 102 mm long)**, welded to detention frames with two **1-inch- (25-mm-)** long welds at each end of angle.
 - c. Connector Angles: Steel angles, of size required, to connect frame angles and embedded plates.
 4. Postinstalled Anchors: Minimum **1/2-inch- (12.7-mm-)** diameter, concealed bolts with expansion shields or inserts. Provide conduit spacer from detention frame to wall; welded to detention frame. Reinforce detention frames at anchor locations.
- I. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material and thickness as detention frame, and as follows:
1. Monolithic Concrete Slabs: Clip anchors, with two holes to receive fasteners; welded to bottom of jambs and mullions with at least four spot welds per anchor or **1/2-inch (12.7-mm)** fillet welds each side.
 2. Separate Topping Concrete Slabs: Adjustable anchors with extension clips, allowing not less than **2-inch (51-mm)** height adjustment; welded to jambs and mullions with at least four spot welds per anchor or **1/2-inch (12.7-mm)** fillet welds each side. Terminate bottom of detention frames at finish floor surface.
- J. Rubber Door Silencers: Except on weather-stripped detention doors, drill stops in strike jambs to receive three silencers on single-detention-door frames and drill head jamb stop to receive two silencers on double-detention-door frames. Keep holes clear during construction.
- K. Grout Guards: Provide factory-installed grout guards of same material as detention frame; welded to detention frame at back of hardware cutouts, silencers, and glazing-stop screw preparations to close off interior of openings and to prevent mortar or other materials from obstructing hardware operation or

installation.

2.6 DETENTION PANELS

- A. Provide fixed detention panels of same materials, construction, and finish as specified for adjoining detention door.

2.7 MOLDINGS AND STOPS

- A. Provide fixed moldings on inmate side of glazed openings and removable stops on non-inmate side.
 - 1. Height: As required to provide minimum **1-inch (25-mm)** glass engagement, but not less than **1-1/4 inches (32 mm)**.
 - 2. Fixed Moldings: Formed from same material as detention door and frame face sheets, but not less than **0.093 inch (2.3 mm)** thick, and spot welded to face sheets at not more than **3 inches (76 mm)** o.c.
 - 3. Removable Stops, Non-Security Glazing: Formed from **0.067-inch- (1.7-mm-)** thick channel, of same material as detention door face sheets. Secure with countersunk security fasteners spaced uniformly not more than **9 inches (229 mm)** o.c. and not more than **2 inches (51 mm)** from each corner, and as necessary to satisfy performance requirements. Form corners with butt or mitered hairline joints.
 - 4. Removable Stops, Security Glazing: Formed from **0.093-inch- (2.3-mm-)** thick angle, of same material as detention door face sheets. Secure with button-head security fasteners spaced uniformly not more than **6 inches (152 mm)** o.c. and not more than **2 inches (51 mm)** from each corner, and as necessary to satisfy performance requirements. Form corners with notched or mitered hairline joints.
- B. Coordinate rabbet width between fixed and removable stops with glass or panel type and installation type indicated.

2.8 SECURITY FASTENERS

- A. Security Fasteners:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**

- d. **[Tamper-Pruf Screws]**
- e. **[Tamperproof Screw Co., Inc.]**
- f. **<Insert manufacturer's name>**

B. Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific fastener type. Provide drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:

- 1. Drive-System Type: **[Pinned Torx-Plus][Pinned Torx]<Insert system>**.
- 2. Fastener Strength: **120,000 psi (827 MPa)**.
- 3. Socket Button-Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879, Group 1 CW.
- 4. Socket Flat Countersunk-Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879, Group 1 CW.
- 5. Socket Head Cap Fasteners:
 - a. Heat-treated alloy steel, ASTM A574.
 - b. Stainless steel, ASTM F837, Group 1 CW.
- 6. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137/F1137M, Grade I, or black oxide unless otherwise indicated.

2.9 SEALANTS

A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Pecora Corporation]**
 - b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Pecora Corporation]**
 - b. **<Insert manufacturer's name>**
- 3. Verify sealant has a VOC content of 250 g/L or less.

- B. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Pecora Corporation]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Pecora Corporation]**
 - b. **<Insert manufacturer's name>**
 3. Verify sealant has a VOC content of 250 g/L or less.

2.10 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- C. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- D. Pass-Through Openings: Fabricate flush openings using **0.093-inch- (2.3-mm-)** thick, interior channels of same material as detention door faces; inverted to be flush with openings; welded to inside of both face sheets and with corners fully welded. Mount shutters on non-inmate side of detention doors. Reinforce for locks and food-pass hinges.
 1. Inset Shutters: Fabricate from two steel plates, **0.123 inch (3.1 mm)** thick, of same material as detention door face sheets; spot welded together and sized to inset inside opening and to prevent inmate tampering of lock and hinges.
 2. Overlapping Shutters: For surface application on non-inmate side of door. Fabricate from a single steel plate, of same material as detention door face sheets, **0.187 inch (4.7 mm)** thick, and sized to overlap food-pass openings by **1/2 inch (12.7 mm)**.
- E. Detention Door Louvers: Fabricate flush louver openings using **0.093-inch- (2.3-mm-)** thick, interior steel channels of same material as detention door faces; welded to inside of both detention door face sheets and with corners fully welded. Provide welded, inverted V- or Y-shaped vanes allowing specified airflow, fabricated from same material as detention door face sheets, **0.093 inch (2.3 mm)** thick, and spaced so no rigid flat instrument can pass through.
 1. Reinforcement: Reinforce louvers that exceed **18 inches (457 mm)** in height at louver midpoint with **1/4-by-1-1/2-inch- (6.3-by-38-mm-)** square, vertical rectangular steel bar or **3/4-inch- (19-mm-)** diameter, vertical steel bar.
 2. Airflow: **<Insert airflow in cfm (L/s)>, <Insert static-pressure loss in inch wg (Pa)>**.
 3. Exterior Detention Door Insect Screens: Fabricated from 12-by-12 mesh of **0.028-inch- (0.71-mm-)** diameter, stainless steel wire or from perforated metal of same material and thickness as detention door face sheet with **1/8-inch- (3-mm-)** diameter holes spaced **1 inch (25 mm)** o.c.;

where indicated.

- F. Speaking Apertures: Consist of a rectangular pattern of holes, minimum **1 inch high by 4 inches wide (25 mm high by 102 mm wide)**, with holes **1/4 inch (6.3 mm)** in diameter. Locate holes in both face sheets directly across from each other and spaced not more than **1 inch (25 mm)** o.c. vertically and horizontally. Provide **0.067-inch- (1.7-mm-)** thick, pressed-steel baffles in interior of detention door between hole patterns to prevent passage of objects. Mount shutters on non-inmate side of detention doors. Reinforce for locks and hinges.
1. Swinging Shutters: Rectangular pan-shaped shutter fabricated from steel sheet, of same material as detention door face sheets, not less than **0.093 inch (2.3 mm)** thick with flange depth not less than **1.0 inch (25.4 mm)**, continuously welded at corners, and sized to overlap speaking aperture by **1/2 inch (12.7 mm)**. Continuous hinge of same material thickness as shutter; fastened with security fasteners or plug welds spaced not less than **1.0 inch (25.4 mm)** from each end and not less than **4.0 inch (102 mm)** o.c. Both ends of hinge welded to prevent tampering. Keeper/pull assembly welded to shutter.
 2. Sliding Shutters: Sliding flat shutter and track assembly fabricated from steel sheet, of same material as detention door face sheets, not less than **0.093 inch (2.3 mm)** thick; shutter sized to overlap speaking aperture by **1/2 inch (12.7 mm)**. Track lined as required for smooth operation. Top and bottom track welded at each end to prevent tampering. Keeper/pull assembly welded to shutter.
- G. Gun Ports: Fabricate units to comply with UL 752 and to resist same security designation as detention doors in which they are installed.

2.11 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
- D. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated on Drawings]<Insert type>**.
- E. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- F. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- G. Masonry Anchors: Fabricated from same steel sheet as door face.
- H. Embedded Anchors: Fabricated from mild steel shapes and plates, hot-dip galvanized in accordance with ASTM A153/A153M.
- I. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Interior Locations: Carbon steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)][Group 2 (A4)]** stainless steel bolts, ASTM F593, and nuts, ASTM F594.

- J. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- K. Glazing: Comply with Section 088853 "Security Glazing."
- L. Grout: Comply with ASTM C476, with a slump of not more than **4 inches (102 mm)** as measured in accordance with ASTM C143/C143M.
- M. Insulation: Slag-wool-fiber/rock-wool-fiber or glass-fiber blanket insulation. ASTM C665, Type I (unfaced); with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics. Minimum **1.5-lb/cu. ft. (24-kg/cu. m)** density.
- N. Bituminous Coating: Cold-applied asphalt mastic, compounded for **15-mil (0.4-mm)** dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- O. Waterborne Asphaltic Emulsion Coating: Minimum **2.5-mil (0.06-mm)** dry film thickness.

2.12 FABRICATION OF DETENTION DOORS AND FRAMES

- A. Fabricate detention doors and frames rigid, neat in appearance, and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate detention doors and frames to comply with manufacturing tolerances indicated in ANSI/NAAMM-HMMA 863.
- C. Removable Jamb Faces: Provide removable jamb faces where required for access to embedded anchors. Fabricate to allow secure reattachment of removable face with security fasteners.
- D. Fabricate multiple-opening detention frames with mullions that have closed tubular shapes and with no visible seams or joints.
- E. Exterior Detention Doors: Provide weep-hole openings in bottoms of detention doors to permit entrapped moisture to escape. Seal joints in top edges of detention doors against water penetration.
- F. Hardware Preparation: Factory prepare detention doors and frames to receive mortised hardware, including cutouts, reinforcement, mortising, drilling, and tapping, in accordance with final Door Hardware Schedule and templates provided by detention door hardware supplier.
 - 1. Reinforce detention doors and frames to receive surface-mounted door hardware. Drilling and tapping may be done at Project site.
 - 2. Locate door hardware in accordance with ANSI/NAAMM-HMMA 863.
- G. Factory cut openings in detention doors.
- H. Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2.13 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM-NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Finish detention doors and frames after assembly.

2.14 METALLIC-COATED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified in "Shop Primer" Subparagraph below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than **0.7 mil (0.02 mm)**.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended in writing by primer manufacturer for zinc-coated steel; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.15 STEEL SHEET FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with **[SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"]**[or]**[SSPC-SP 8, "Pickling"]**<Insert surface preparation method>.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified in "Shop Primer" Subparagraph below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than **0.7 mil (0.02 mm)**.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with SDI A250.10 acceptance criteria; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.16 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention frame connections before detention frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Inspect embedded plate installations before installing detention frames to verify that plate installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace plates where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Before installation and with shipping spreaders removed, adjust detention frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb and perpendicular to frame head.
 - 2. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of face.
 - 3. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of door rabbet.
 - 4. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a perpendicular line from head to floor.

3.3 INSTALLATION OF DETENTION DOORS AND FRAMES

- A. General: Install detention doors and frames plumb, rigid, properly aligned, and securely fastened in place; complying with Drawings, schedules, and manufacturer's written instructions.
- B. Anchorage: Set detention frame anchorage devices in accordance with details on Shop Drawings and in accordance with anchorage device manufacturer's written instructions.
 - 1. Masonry Anchors: Coordinate frame installation to allow for solidly filling space between frames and masonry with grout.
 - 2. Embedded Anchors: Install embedded plates in wall surrounding frame openings to match frame angle locations.
 - 3. Postinstalled Anchors: Drill holes in existing construction at locations to match bolt locations, and install bolt expansion shields or inserts.

- C. Where detention frames are fabricated in sections due to shipping limitations, assemble frames and install angle splices at each corner, of same material and thickness as detention frame, and extend at least **4 inches (102 mm)** on both sides of joint.
1. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
 2. Continuously weld and finish smooth joints between faces of abutted, multiple-opening, detention frame members.
 3. Field Welding: Comply with the following requirements:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Apply bituminous[**waterborne asphaltic emulsion**] coating to backs of frames before filling with grout.
- E. Placing Detention Frames: Install detention frames of sizes and profiles indicated. Set detention frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
1. Embedded Anchors: Remove jamb faces from detention frames and set detention frames into opening. Weld steel connector angle to frame angle and to embedded plate with **1-inch- (25-mm-)** long welds at each end of connector angle to form a rigid frame assembly that is solidly anchored. Reinstall jamb faces using security fasteners.
 2. Postinstalled Anchors: Install bolt. After bolt is tightened, weld bolt head to provide nonremovable condition. Grind, dress, and finish smooth the welded bolt head.
 3. At fire-rated openings, install detention frames in accordance with NFPA 80.
 4. Install detention frames with removable stops located on non-inmate side of opening.
- F. Grout: Fully grout detention frame jambs and heads. Completely fill space between frames and adjacent substrates. Hand trowel grout and take other precautions, including bracing detention frames, to ensure that frames are not deformed or damaged by grout forces.
- G. Security Sealant: Apply [**polyurethane**][**epoxy**] security sealant at all exposed gaps between detention frames and adjacent substrates.
- H. Swinging Detention Doors: Fit non-fire-rated detention doors accurately in their frames, with the following clearances:
1. Between Doors and Frames at Jambs and Head: **1/8 inch (3.2 mm)**.
 2. Between Edges of Pairs of Doors: **1/8 inch (3.2 mm)**.
 3. Floor Clearance: Allowing for functional operation of swinging doors, but not less than **1/8 inch (3.2 mm)**.
- I. Sliding Detention Doors: Fit sliding detention doors in their frames in accordance with manufacturer's written instructions and as required to allow doors to slide without binding.
- J. Fire-Rated Detention Doors: Install with clearances as specified in NFPA 80.
- K. Smoke-Control Detention Doors: Install in accordance with NFPA 105.

- L. Installation Tolerances: Comply with installation tolerances indicated in ANSI/NAAMM-HMMA 863.
- M. Glazing: Comply with installation requirements in Section 088853 "Security Glazing" unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
 - 1. Perform additional inspections to determine compliance of replaced or additional work.
 - 2. Detention work will be considered defective if it does not pass tests and inspections.
- B. Prepare field quality control certification[**endorsed by Detention Specialist**] that states installed products comply with requirements in the Contract Documents.
- C. For verification that construction complies with requirements, select one detention door at random from detention doors delivered to Project and have it cut in half or otherwise taken apart.
 - 1. Test Method: Verify weld strength by prying or chiseling door apart at edge seams, end channels, or stiffeners. Not more than 5 percent of welds may fail test.
 - a. If tested door fails, replace or rework all detention doors to bring them into compliance at Contractor's expense.
 - b. If tested door passes, replace tested door at Contractor's expense.
- D. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including detention doors and frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off detention doors and frames immediately after installation.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.
- D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
 - 1. After finishing smooth field welds, apply air-drying primer.
- E. Stainless Steel Surfaces: Clean surfaces in accordance with manufacturer's written instructions.

END OF SECTION 11 98 12 00A



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Task	Specification	Specification Description
11 98 12 00	11 98 14 00	Detention Door Hardware
11 98 12 00	12 55 00 00	Detention Furniture



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SECTION 11 98 14 00 - DETENTION DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Detention hinges.
2. Mechanical detention locks and latches.
3. Electromechanical detention locks and latches.
4. Pneumatic detention locks and latches.
5. Switches.
6. Detention operating trim.
7. Security door closers.
8. Detention door stops.
9. Sliding detention door device assemblies.
10. Key-control system.
11. Security fasteners.

B. Related Requirements:

1. Section 013513.16 "Special Project Procedures for Detention Facilities" for general requirements for detention work, including responsibilities of a detention specialist.
2. Section 119812 "Detention Doors and Frames" for door and frame preparation, reinforcement, and door silencers provided as part of hollow-metal detention doors and frames manufactured in accordance with HMMA 863. Section 119812 also includes astragals provided as part of fire-rated labeled assemblies.
3. Section 221513 "General-Service Compressed-Air Piping" and Section 221519 "General-Service Packaged Air Compressors and Receivers" for compressed-air piping for pneumatic detention door hardware.
4. Section 283100 "Intrusion Detection" for detection devices installed at detention door openings as part of an intrusion detection system.
5. Section 283121 "Area and Perimeter Intrusion Detection" for detection devices installed at detention gate openings as part of a perimeter security system.

1.2 COORDINATION

- A. Templates: Obtain and distribute, to the parties involved, templates for detention doors, frames, and other work specified to be factory prepared for installing detention door hardware.
- B. Electrical System Roughing-In: Coordinate layout and installation of electrically powered detention door hardware with connections to **[power supplies][perimeter security system][detention monitoring and control system][fire-alarm system and detection devices][and][building control system]**.
- C. Compressed-Air System Roughing-In: Coordinate layout and installation of pneumatic detention door hardware with connections to **[compressed-air supplies][detention monitoring and control system][fire-alarm system and detection devices][and][building control system]**.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Inspect and discuss power and control system roughing-in and other preparatory work performed by other trades.
 - 2. Review sequence of operation for each type of detention door hardware.
 - 3. Review and finalize a construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Certifying procedures.
 - 5. **<Insert agenda items>**.
- B. Detention Keying Conference: Conduct conference at **[Project site]<Insert location>**.
 - 1. Conference participants to include Installer.
 - 2. Incorporate detention keying conference decisions into Project's final Detention Keying Schedule after reviewing detention door hardware keying system including, but not limited to, the following:
 - a. Preliminary key system schematic diagram.
 - b. Requirements for key-control system.
 - c. Requirements for access control.
 - d. Address for delivery of keys.
 - e. **<Insert requirements to suit Project>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of detention door hardware.
- B. Shop Drawings: For each type of detention door hardware.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring; differentiate between manufacturer-installed and field-installed wiring for detention door hardware. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram, including location of connections.
 - c. Riser diagram.
 - d. Elevation of each detention door type.
 - 3. Compressed-Air System Diagrams: For compressed-air piping for door-control systems; differentiate between manufacturer-installed and field-installed piping for pneumatic detention door hardware. Include the following:
 - a. System schematic.
 - b. Point-to-point piping diagram.
 - c. Riser diagram.
 - d. Elevation of each detention door type.
 - 4. Detail interface between electrically powered detention door hardware and **[perimeter security][detention monitoring and control][fire-alarm][and][building control]** system.
 - 5. Detail interface between pneumatic detention door hardware and **[perimeter security][detention**

monitoring and control][fire-alarm][and][building control] system.

- C. Samples: Submit samples to Architect only upon request.
 - 1. Submit one sample of each hardware product requested, in finish specified.
 - 2. Tag Sample with full product description to coordinate with Detention Door Hardware Schedule.
 - 3. Samples will be returned to Supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Detention Door Hardware Schedule: Prepared by or under the supervision of Supplier, detailing fabrication and assembly of door hardware as well as installation procedures and wiring diagrams. Coordinate the Detention Door Hardware Schedule with detention doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of detention door hardware.
 - 1. Integrate detention door hardware indicated in "Detention Door Hardware Schedule" Article into Project's final Detention Door Hardware Schedule, and indicate complete designations of every item required for each detention door and opening.
 - 2. Keying Schedule: Coordinate detention keying with other door hardware in Project's final Detention Keying Schedule. Include floor plan of each floor, indicating keymarks, lock types, and key access sides required at each detention door and opening.
 - 3. Indicate each detention lock and type of key cylinder using the following prefixes: "P" for paracentric, "M" for mogul, "HS" for high security, and "C" for commercial.
 - 4. Indicate security level of each item.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of **[detention lock and latch][security door closer][and][sliding detention door device]**, for tests performed by **[manufacturer and witnessed by a qualified testing agency][a qualified testing agency]**.
- B. Examination reports documenting inspections of substrates, areas, and conditions.
- C. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- D. Field quality-control reports documenting inspections of installed products.
 - 1. Field quality-control certification signed by Contractor **[and Detention Specialist]**.
- E. Qualification Statements: For **[Installer][Supplier][and][Architectural Hardware Consultant]**.
- F. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Contracts:
 - 1. Maintenance service.
- B. Operation and Maintenance Data: For detention door hardware to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the

following:

- a. Normal remote security operation.
- b. Normal local security operation.
- c. Emergency security operation.
- d. Hardware schedules.
- e. Catalog cuts for all hardware.
- f. Templates.
- g. **<Insert special requirements>**.

C. Warranty Documentation:

1. Manufacturers' special warranties.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of detention door hardware.

B. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Detention Door Hardware: **<Insert detailed descriptions and specific numbers of units>**.
2. Electrical Parts: **<Insert detailed descriptions and specific numbers of units>**.
3. Pneumatic Parts: **<Insert detailed descriptions and specific numbers of units>**.
4. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
5. Tools: Provide **[two]<Insert number>** sets of tools for installing and removing security fasteners.

C. Schedule of maintenance material items.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer and an authorized representative of detention door hardware manufacturer for installation and maintenance of units required for this Project.
2. Suppliers: Detention Door Hardware Supplier with warehousing facilities in Project's vicinity who is, or employs, a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about detention door hardware and keying.
 - a. Detention Door Hardware Supplier Qualifications: An experienced Detention Door Hardware Supplier who has completed projects with electrically powered[**and pneumatic**] detention door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - 1) Engineering Responsibility: Prepare data for electrically powered[**and pneumatic**] detention door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- 2) Scheduling Responsibility: Preparation of Detention Door Hardware and Keying schedules.
3. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for detention door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - a. **[Architectural Hardware Consultant (AHC)][Architectural Hardware Consultant (AHC) who is also an Electrified Hardware Consultant (EHC)][Architectural Openings Consultant (AOC)].**

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory detention door hardware on receipt and provide secure lockup for detention door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the Detention Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver detention door keys to Owner by registered mail or overnight package service[.], **addressed as follows:**
 1. **<Insert name and address of Owner's representative>.**

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of detention door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including **<Insert type of failure>.**
 - b. Faulty operation of operators and detention door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal **[weathering][or][use].**
 - d. **<Insert conditions relating to specified products>.**
 - e. **<Insert failure modes>.**
 2. Warranty Period: **[Three]<Insert number>** years from date of Substantial Completion.
 3. Warranty Period for Continuous-Pin Detention Hinges: **[10]<Insert number>** years from date of Substantial Completion.
 4. Warranty Period for Security Door Closers: **[10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Swinging Detention Door Assemblies: Provide detention door hardware as part of a detention door assembly that complies with security grade indicated, when tested in accordance with ASTM F1450,

based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

1. Bullet Resistance: Comply with **[Level 3]<Insert level>** rating when tested in accordance with UL 752; where indicated **[on Drawings][in door schedule]**.
 - a. Listed and labeled as bullet resistant by a testing agency acceptable to authorities having jurisdiction.
2. Tool-Attack Resistance: Comply with small-tool-attack-resistance rating when tested in accordance with UL 1034 and UL 437; where indicated **[on Drawings][in Detention Door Hardware Schedule]**.

2.2 DETENTION DOOR HARDWARE, GENERAL

- A. Provide detention door hardware for each door as scheduled in "Detention Door Hardware Schedule" Article to comply with requirements in this Section.
 1. Detention Door Hardware Sets: Provide quantity, item, size, finish, or color indicated.
 2. Sequence of Operation: Provide electrically powered detention door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Include all accessories and fasteners required for a complete installation.
- B. Electrically Powered Detention Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Detention Door Hardware Control and Monitoring: Provide detention door hardware with features, functions, and internal equipment required to perform control and monitoring functions indicated in Section 285213 "Detention Monitoring and Control System and Interfaces."
- D. Obtain mechanical detention door hardware from same manufacturer as that of electrically powered or pneumatic detention door hardware.
- E. Regulatory Requirements:
 1. Fire-Rated Detention Door Assemblies: Provide detention door hardware for assemblies complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 2. Where indicated to comply with accessibility requirements, comply with **[the DOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[ICC A117.1]****[and]<Insert regulation>**.

2.3 DETENTION HINGES

- A. Standard for Electric Detention Hinges: UL 634.
- B. Utility-Door Detention Hinges: Heavy weight, plain bearing; fabricated from cast iron or steel; **3/8-inch-(9.5-mm-)** diameter, case-hardened,**[fully welded,]** steel hinge pin; full surface.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. <Insert manufacturer's name>
 3. Leaves: [Drilled for countersunk security fasteners][Solid].
 4. Size: Minimum 3 by 4 by 0.200 inch (75 by 102 by 5 mm).
 5. Security Grade: [1][2][3][4] in accordance with ASTM F1758.
 6. Finish: ANSI/BHMA 600.
- C. Food-Pass Detention Hinges: Heavy weight, plain bearing; fabricated from cast iron or steel; 3/8-inch-(9.5-mm-) diameter, case-hardened, [fully welded,] steel hinge pin; with applied stop preventing door from opening more than 90 degrees and supporting door in horizontal position as a shelf; full surface.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. [STANLEY; dormakaba USA, Inc.]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. [STANLEY; dormakaba USA, Inc.]
 - f. <Insert manufacturer's name>
 3. Leaves: [Drilled for countersunk security fasteners][Solid].
 4. Size: Minimum 3 by 4 by 0.200 inch (75 by 102 by 5 mm).
 5. Security Grade: [1][2][3][4] in accordance with ASTM F1758.
 6. Finish: ANSI/BHMA 600.
- D. Full Mortise Hinges: Heavy weight; with welded hospital tips and two concealed maintenance-free ball bearings; fabricated from cast stainless steel; with integral security stud and non-removable stainless steel hinge pin.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **[STANLEY; dormakaba USA, Inc.]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **[STANLEY; dormakaba USA, Inc.]**
 - e. **<Insert manufacturer's name>**
 3. Leaves: Drilled to ANSI/BHMA A156.7 template dimensions for countersunk security fasteners.
 4. Size: Minimum **4-1/2 by 4-1/2 by 3/16 inch (102 by 102 by 4.76 mm)**.
 5. Security Grade: **[1][2][3][4]** in accordance with ASTM F1758.
 6. Finish: ANSI/BHMA 630.
- E. Full-Surface Detention Hinges: Extra heavy weight; two heavy-duty thrust bearings with hardened-steel ball bearings; fabricated from steel plate; **3/4-inch- (19-mm-)** diameter, case-hardened, fully welded, steel hinge pin.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **[RR Brink Locking Systems, Inc.]**
 - e. **[Southern Folger Detention Equipment Company]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **[RR Brink Locking Systems, Inc.]**
 - e. **[Southern Folger Detention Equipment Company]**
 - f. **<Insert manufacturer's name>**
 3. Leaves: **[Drilled for countersunk security fasteners][Solid]**.
 4. Size: Minimum **5 by 5-3/4 by 1/2 inch (127 by 146 by 13 mm)**.

5. Security Grade: [1][2][3][4] in accordance with ASTM F1758.
 6. Finish: ANSI/BHMA 600.
- F. Half-Surface Detention Hinges: Extra heavy weight; two heavy-duty thrust bearings with hardened-steel ball bearings; fabricated from steel plate; **3/4-inch- (19-mm-)** diameter, case-hardened, fully welded, steel hinge pin.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **<Insert manufacturer's name>**
 3. Leaves: **[Drilled for countersunk security fasteners][Solid]**.
 4. Size: Minimum **5 by 5-1/4 by 1/2 inch (127 by 133 by 13 mm)**.
 5. Security Grade: [1][2][3][4] in accordance with ASTM F1758.
 6. Finish: ANSI/BHMA 600.
- G. Gap-Mounted Detention Hinges: Extra heavy weight; two heavy-duty thrust bearings with hardened-steel ball bearings; fabricated from steel plate; **3/4-inch- (19-mm-)** diameter, case-hardened, fully welded, steel hinge pin.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Southern Folger Detention Equipment Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[brookfield industries, inc.]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Southern Folger Detention Equipment Company]**
 - e. **<Insert manufacturer's name>**

3. Leaves: **[Drilled for countersunk security fasteners][Solid]**.
4. Size: Minimum **5 by 6 by 1/2 inch (127 by 152 by 13 mm)**.
5. Security Grade: **[1][2][3][4]** in accordance with ASTM F1758.
6. Finish: ANSI/BHMA 600.

H. Continuous-Pin Detention Hinges: Minimum **0.109-inch- (2.78-mm-)** thick, stainless steel hinge leaves with minimum overall width of **4 inches (102 mm)**; with **1/4-inch- (6-mm-)** diameter continuous pin; fabricated to full height of detention door and frame. Finish components after milling and drilling are complete. Fabricate continuous-pin detention hinges to template screw locations.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Markar Architectural Products, Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Markar Architectural Products, Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY]**
 - b. **<Insert manufacturer's name>**
3. Security Grade: **[1][2][3][4]** in accordance with ASTM F1758.
4. Finish: ANSI/BHMA 630.

2.4 MECHANICAL DETENTION LOCKS AND LATCHES

A. Lock Mountings:

1. Hollow-Metal Detention Doors: Mount detention lock to back of **[0.179-inch (4.56-mm) nominal-thickness steel][0.183-inch (4.65-mm) nominal-thickness, galvanized-steel]** cover plate for installation in lock pocket fabricated into detention door. Attach cover plate to hollow-metal detention door with security fasteners.
2. Bar-Grille Detention Doors: Mount detention lock to back of **[galvanized-]steel** enclosure welded to flat horizontal bars of bar-grille detention door; cover with **[0.179-inch (4.56-mm) nominal-thickness steel][0.183-inch (4.65-mm) nominal-thickness, galvanized-steel]** plate. Attach plate with security fasteners.
3. Steel-Plate Detention Doors: Mount detention lock to inside surface of **[0.179-inch (4.56-mm) nominal-thickness steel][0.134-inch (3.42-mm) nominal-thickness steel][0.183-inch (4.65-mm) nominal-thickness, galvanized-steel][0.138-inch (3.50-mm) nominal-thickness, galvanized-steel]** enclosure with integrally formed mounting flanges. Attach enclosure to steel-plate detention door with **[security fasteners][rivets]**.

B. Utility-Door Mechanical Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [RR Brink Locking Systems, Inc.]
 - c. [Southern Folger Detention Equipment Company]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [RR Brink Locking Systems, Inc.]
 - c. [Southern Folger Detention Equipment Company]
 - d. <Insert manufacturer's name>
 3. Function: Lockbolt retracted and extended by [five][six]-tumbler paracentric cylinder; keyed [one side][two sides].
 4. Lockbolt: 1-1/2 inches high by 3/4 inch (38 mm high by 19 mm) thick; 5/8-inch (16-mm) throw.
 5. Security Grade: [1][2][3][4] in accordance with ASTM F1577.
- C. Utility-Door Mechanical Deadlocks, Mogul Cylinder:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Southern Folger Detention Equipment Company]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Southern Folger Detention Equipment Company]
 - b. <Insert manufacturer's name>
 3. Function: Lockbolt retracted and extended by mogul cylinder; keyed [one side][two sides].
 4. Lockbolt: 1-1/2 inches high by 3/4 inch (38 mm high by 19 mm) thick; 5/8-inch (16-mm) throw.
 5. Security Grade: [1][2][3][4] in accordance with ASTM F1577.
- D. Utility-Door Mechanical Snaplatches, Paracentric Cylinder:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [RR Brink Locking Systems, Inc.]
 - c. [Southern Folger Detention Equipment Company]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
- b. [RR Brink Locking Systems, Inc.]
- c. [Southern Folger Detention Equipment Company]
- d. <Insert manufacturer's name>

- 3. Function: Automatic snaplatch when door is closed; latchbolt retracted by [five][six]-tumbler paracentric cylinder; keyed [one side][two sides].
- 4. Latchbolt: 1 inch high by 7/16 inch (25 mm high by 11 mm) thick; 5/16-inch (8-mm) throw.
- 5. Security Grade: [1][2][3][4] in accordance with ASTM F1577.

E. Utility-Door Mechanical Snaplatches, Mogul Cylinder:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Southern Folger Detention Equipment Company]
 - b. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Southern Folger Detention Equipment Company]
 - b. <Insert manufacturer's name>
- 3. Function: Automatic snaplatch when door is closed; latchbolt retracted by mogul cylinder; keyed [one side][two sides].
- 4. Latchbolt: 1 inch high by 7/16 inch (25 mm high by 11 mm) thick; 5/16-inch (8-mm) throw.
- 5. Security Grade: [1][2][3][4] in accordance with ASTM F1577.

F. Mechanical Snaplatches, Paracentric Cylinder:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Southern Folger Detention Equipment Company]
 - c. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Southern Folger Detention Equipment Company]
 - c. <Insert manufacturer's name>
- 3. Function: Automatic snaplatch when door is closed; latchbolt retracted by five-tumbler paracentric cylinder; keyed one side. When closed, latch is concealed within lock case.
- 4. Latchbolt: 1 inch high by 7/16 inch (25 mm high by 11 mm) thick; 7/16-inch (11-mm) throw.
- 5. Provide angled strike.

6. Security Grade: [1][2][3][4] in accordance with ASTM F1577.

G. Sliding-Door Mechanical Deadlatches, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Hookbolt snaplatches and automatically deadlocks through action of plunger pin when door is closed (slam locking); hookbolt raised by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**.
4. Hookbolt: **1/2-inch- (13-mm-)** thick, case-hardened steel; **5/8-inch (16-mm)** lift.
5. Provide case-hardened-steel deadlock plunger pin.
6. Security Grade: [1][2][3][4] in accordance with ASTM F1643.

H. Sliding-Door Mechanical Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Hookbolt raised and lowered by **[five][six]**-tumbler paracentric cylinder (no slam locking); keyed **[one side][two sides]**.
4. Hookbolt: **1/2-inch- (13-mm-)** thick, case-hardened steel; **5/8-inch (16-mm)** lift.
5. Security Grade: [1][2][3][4] in accordance with ASTM F1643.

I. Mechanical Snaplatch/Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Automatic snaplatch when door is closed (slam locking) with key-operated deadlock; latchbolt retracted by half turn and extended by full turn in opposite direction of **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**.
 - a. Knob operation retracts latchbolt unless deadlocked. Locate knobs on **[one side][two sides]**.
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick steel, with two case-hardened-steel insert pins; **3/4-inch (19-mm)** throw; **[1/2-inch (13-mm)][1-1/4-inch (32-mm)]** bolt projection when retracted.
5. Listed and labeled for use on fire doors.
6. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

J. Mechanical Deadlatches/Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**

3. Function: Automatic snaplatch and automatic deadlock through action of actuator when door is closed (slam locking); latchbolt retracted by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**.
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick steel, with two case-hardened-steel insert pins; **3/4-inch (19-mm)** throw; **[1/2-inch (13-mm)][1-1/4-inch (32-mm)]** bolt projection when retracted.
5. Deadlock Actuator: **3/4-inch-high by 3/4-inch- (19-mm-high by 19-mm-)** thick steel; **1/2-inch (13-mm)** throw.
6. Listed and labeled for use on fire doors.
7. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

K. Mechanical Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Deadlocked in both locked and unlocked position; latchbolt retracted and extended by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**.
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick steel, with two case-hardened-steel insert pins; **3/4-inch (19-mm)** throw; **[1/2-inch (13-mm)][1-1/4-inch (32-mm)]** bolt projection when retracted.
5. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

L. Cremone Bolt Mechanical Snaplatches, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**

3. Function: Automatic snaplatch and deadlocking when door is closed (slam locking); latchbolt retracted and extended by five-tumbler paracentric cylinder; keyed **[one side][two sides]**. Lever operation **[one side][two sides]** retracts head and foot rods, unless deadlocked, for three-point locking.
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick steel, with two case-hardened-steel insert pins; **3/4-inch (19-mm)** throw.
5. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

M. Cremone Bolt Mechanical Deadlocks, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
3. Function: Active leaf deadlocks when door is closed (no slam locking); active-leaf deadbolt retracted and extended by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**. Active-leaf lever operation **[one side][two sides]** retracts active-leaf head and foot bolts unless deadlocked.
 - a. Inactive Leaf: Head and foot bolts deadlocked by **[five][six]**-tumbler, inactive-leaf paracentric cylinder. Inactive-leaf lever operation **[one side][two sides]** retracts inactive-leaf head and foot bolts unless deadlocked.
4. Deadbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick steel, with two case-hardened-steel insert pins; **3/4-inch (19-mm)** throw.
5. Head and Foot Bolts: **7/8-inch (22-mm)** diameter; **3/4-inch (19-mm)** throw.
6. Provide foot bolt receptacle(s).
7. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

N. Mechanical Head and Foot Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Southern Folger Detention Equipment Company]**

- b. **<Insert manufacturer's name>**
 - 3. Function: **[Head][Foot][Head and foot]** bolt retracted and extended by **[spanner-type key][five-tumbler paracentric cylinder]**; **enclosed in iron or steel case with steel cover**.
 - 4. Latchbolt: **1-inch- (25-mm-) diameter steel; 3/4-inch (19-mm) throw.**
 - 5. Foot Bolt Receptacle: Spring-loaded mechanism; brass.
 - 6. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- O. Institutional Mortise Locksets:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 - 3. Function: Functions and keying, in accordance with ASTM F1577, as indicated in detention door hardware sets.
 - 4. Cylinder: **[High-security builders][Mogul]**.
 - 5. Latchbolt: **1-1/8-inch-high by 3/4-inch- (29-mm-high by 19-mm-) thick stainless steel; 3/4-inch (19-mm) throw.**
 - 6. Deadbolt: **1-1/4-inch-high by 3/4-inch- (32-mm-high by 19-mm-) thick stainless steel; 1-inch (25-mm) throw.**
 - 7. Faceplate: Stainless steel.
 - 8. Strike: Stainless steel.
 - 9. Listed and labeled for use on fire doors.
 - 10. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

2.5 ELECTROMECHANICAL DETENTION LOCKS AND LATCHES

- A. Connectors: Provide electromechanical detention locks and latches with factory-wired plug connector with **6-inch (152-mm)** wire pigtail.
 - 1. Provide security ring for installation of electromechanical detention lock in hollow-metal detention frame, welded to frame or access cover.
 - 2. Equip direct-current, solenoid-operated detention locks and latches with diode transient voltage protection at each locking device.
- B. Solenoid-Operated Deadlatches, Paracentric Cylinder:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric solenoid that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[five][six]-tumbler paracentric cylinder; keyed [one side][two sides]**; if latchbolt is retracted by key, it remains retracted until relocked by key.
 - a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated; latchbolt extends when power is discontinued]**.
 - b. If power fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-) thick hardened steel; 3/4-inch (19-mm) throw.**
5. Provide internal deadlock indicator switch.
6. Provide roller-type deadlock actuator.
7. Voltage: 120 V ac.
8. Listed and labeled for use on fire doors.
9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

C. Motor-Operated Deadlatches, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric motor that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[five][six]-tumbler paracentric cylinder; keyed [one side][two sides]**; if latchbolt is retracted by key, it remains retracted until relocked by key.
 - a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then**

- releases][as long as control switch is activated; latchbolt extends when power is discontinued].**
- b. If power fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-)** thick hardened steel; **3/4-inch (19-mm)** throw.
5. Provide internal deadlock indicator switch.
6. Provide roller-type deadlock actuator.
7. Voltage: **[120 V ac][24 V dc]**.
8. Listed and labeled for use on fire doors.
9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- D. Sliding-Door, Motor-Operated Deadlatches, Paracentric Cylinder:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[Southern Folger Detention Equipment Company]**
- b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Southern Folger Detention Equipment Company]**
- b. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric motor that raises hookbolt; spring-loaded actuator pin pushes door open **1 to 3 inches (25 to 75 mm)**; automatic latching and deadlocking when door is closed (slam locking). Hookbolt can be mechanically raised by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**; if hookbolt is raised by key, it remains raised until relocked by key.
- a. Latchback: Hookbolt remains raised **[until door is opened 2 inches (51 mm), then lowers][as long as control switch is in open position; hookbolt lowers when control switch is moved to locked position]**.
- b. If power fails, hookbolt automatically deadlocks (fail-secure).
4. Hookbolt: **1-3/4- by 1/2-inch- (44- by 13-mm-)** thick, case-hardened steel; **3/4-inch (19-mm)** throw.
5. Provide internal deadlock indicator switch.
6. Provide case-hardened-steel deadlock actuator.
7. Voltage: 120 V ac.
8. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- E. Solenoid-Operated Deadlatches, Mogul Cylinder:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[RR Brink Locking Systems, Inc.]**
- b. **[Southern Folger Detention Equipment Company]**

- c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric solenoid that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by mogul cylinder; keyed **[one side][two sides]**.
 - a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated; latchbolt extends when power is discontinued]**.
 - b. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - c. Key Holdback: If latchbolt is retracted by key, it remains retracted until relocked by key.
 - d. Knob operation retracts latchbolt; always active.
 - e. If power fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **1-1/2-inch-high by 3/4-inch- (38-mm-high by 19-mm-) thick hardened steel; 1-inch (25-mm) throw.**
5. Provide internal deadlock indicator switch.
6. Provide roller-type deadlock actuator.
7. Voltage: 120 V ac.
8. Listed and labeled for use on fire doors.
9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

F. Motor-Operated Deadlatches, Mogul Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric motor that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by mogul cylinder; keyed **[one side][two sides]**.

- a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is in open position; latchbolt extends when control switch is moved to locked position]**.
 - b. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - c. Key Holdback: If latchbolt is retracted by key, it remains retracted until relocked by key.
 - d. Knob operation retracts latchbolt; always active.
 - e. If power fails, latchbolt automatically deadlocks (fail-secure).
 4. Latchbolt: **1-1/2-inch-high by 3/4-inch- (38-mm-high by 19-mm-)** thick hardened steel; **1-inch (25-mm)** throw.
 5. Provide internal deadlock indicator switch.
 6. Provide roller-type deadlock actuator.
 7. Voltage: **[120 V ac][24 V dc]**.
 8. Listed and labeled for use on fire doors.
 9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- G. Solenoid-Operated Deadlatches, Commercial Cylinder:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 3. Function: Remote switch activates electric solenoid that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[high-security]commercial cylinder; keyed [one side][two sides]**.
 - a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated; latchbolt extends when power is discontinued]**.
 - b. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - c. If power fails, latchbolt automatically deadlocks (fail-secure).
 4. Latchbolt: **1-1/2-inch-high by 5/8-inch- (38-mm-high by 16-mm-)** thick hardened steel; **3/4-inch (19-mm)** throw.
 5. Provide internal deadlock indicator switch.
 6. Deadlock Actuator: Stainless steel.
 7. Strike: Stainless steel.
 8. Voltage: 24 V dc.
 9. Listed and labeled for use on fire doors.
 10. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

H. Motor-Operated Deadlatches, Commercial Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
3. Function: Remote switch activates electric motor that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[high-security]**commercial cylinder; keyed **[one side][two sides]**.
 - a. Latchback: Latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is in open position; latchbolt extends when control switch is moved to locked position]**.
 - b. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - c. If power fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **1-1/2-inch-high by 5/8-inch- (38-mm-high by 16-mm-)** thick hardened steel; **3/4-inch (19-mm)** throw.
5. Provide internal deadlock indicator switch.
6. Deadlock Actuator: Stainless steel.
7. Strike: Stainless steel.
8. Voltage: 24 V dc.
9. Listed and labeled for use on fire doors.
10. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

I. Institutional Electromechanical Mortise Lockset:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
 3. Function: Functions and keying, in accordance with ASTM F1577, as indicated in detention door hardware sets.
 4. Cylinder: **[High-security builders][Mogul]**.
 5. Latchbolt: **1-1/8-inches-high by 3/4-inch- (29-mm-high by 19-mm-) thick stainless steel; 3/4-inch (19-mm) throw.**
 6. Faceplate: Stainless steel.
 7. Strike: Stainless steel.
 8. Voltage: 24 V dc.
 9. Listed and labeled for use on fire doors.
 10. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- J. Solenoid-Operated Gate Locks, Paracentric Cylinder:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Southern Folger Detention Equipment Company]**
 - b. **<Insert manufacturer's name>**
 3. Function: Remote switch activates electric solenoid that raises an internal bolt; automatic deadlocking when gate is closed. Bolt can be mechanically retracted by **[five][six]**-tumbler paracentric cylinder; keyed **[one side][two sides]**.
 - a. Latchback: Bolt remains raised until gate is closed.
 - b. If power fails, latchbolt automatically deadlocks (fail-secure).
 4. Bolt: **5/8-inch- (16-mm-) diameter stainless steel; 1-inch (25-mm) throw.**
 5. Provide internal deadlock indicator switch.
 6. Voltage: 120 V ac.
 7. Finish: Galvanized.
 8. Mounting: Mount lock to gate post; mount locking tongue to gate frame.
 9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

2.6 PNEUMATIC DETENTION LOCKS AND LATCHES

- A. Operation: Provide pneumatic detention locks and latches that operate when supplied with air between **40 psig (275 kPa) minimum and 100 psig (690 kPa) maximum.**
- B. Factory install quick-connect air fitting and factory-wired plug connector with **6-inch (152-mm) wire pigtail.**
 1. Provide security ring for installation of pneumatic detention lock in hollow-metal detention frame, welded to frame or access cover.

C. Pneumatic Deadlatches, Paracentric Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
3. Function: Remote switch activates pneumatic cylinder that retracts latchbolt; latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated]**; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[five][six]-tumbler paracentric cylinder; keyed [one side][two sides]**.
 - a. If power fails or compressed-air system fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **2-inch-high by 3/4-inch- (51-mm-high by 19-mm-) thick hardened steel; 3/4-inch (19-mm) throw.**
5. Provide internal deadlock indicator switch.
6. Provide roller-type deadlock actuator.
7. Voltage: 24 V dc.
8. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

D. Pneumatic Deadlatches, Mogul Cylinder:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
3. Function: Remote switch activates pneumatic cylinder that retracts latchbolt; latchbolt remains

retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated]**; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by mogul cylinder; keyed **[one side][two sides]**.

- a. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - b. Knob on opposite side of cylinder retracts latchbolt.
 - c. If power fails or compressed-air system fails, latchbolt automatically deadlocks (fail-secure).
4. Latchbolt: **1-1/2-inch-high by 3/4-inch- (38-mm-high by 19-mm-)** thick hardened steel; **1-inch (25-mm)** throw.
 5. Provide internal deadlock indicator switch.
 6. Provide roller-type deadlock actuator.
 7. Voltage: 24 V dc.
 8. Listed and labeled for use on fire doors.
 9. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.
- E. Pneumatic Deadlatches, Commercial Cylinder:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 3. Function: Remote switch activates pneumatic cylinder that retracts latchbolt; latchbolt remains retracted **[until door is opened 2 inches (51 mm), then releases][as long as control switch is activated]**; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by **[high-security]**commercial cylinder; keyed **[one side][two sides]**.
 - a. Local Electric Key (LEK): Inmate key operates lock electrically when enabled; staff key always operates lock manually and electrically.
 - b. If power fails or compressed-air system fails, latchbolt automatically deadlocks (fail-secure).
 4. Latchbolt: **1-1/2-inch-high by 5/8-inch- (38-mm-high by 16-mm-)** thick hardened steel; **3/4-inch (19-mm)** throw.
 5. Faceplate: Stainless steel.
 6. Provide internal deadlock indicator switch.
 7. Provide roller-type deadlock actuator.
 8. Voltage: 24 V dc.
 9. Listed and labeled for use on fire doors.
 10. Security Grade: **[1][2][3][4]** in accordance with ASTM F1577.

2.7 DETENTION LOCK TRIM

- A. Levers: Solid stainless steel.
- B. Knobs: **[Stainless steel][Brass]**.
- C. Escutcheons for Paracentric Locks: **0.125-inch- (3.18-mm-)** thick, **3-inch- (75-mm-)** diameter **[stainless steel with ANSI/BHMA 630][brass with ANSI/BHMA 606]** finish. Attach with security fasteners.
 - 1. Style: **[Single wing][Double wing][Single or double wing as required by lock function][As indicated]**.
- D. Cylinder Shields for Paracentric Locks: **0.125-inch- (3.18-mm-)** thick, **3-inch- (75-mm-)** diameter **[stainless steel with ANSI/BHMA 630][brass with ANSI/BHMA 606]** finish and swinging cover to protect keyhole. Attach with security fasteners.
 - 1. Style: **[Single wing][Double wing][Single or double wing as required by lock function][As indicated]**.

2.8 DETENTION CYLINDERS AND KEYING

- A. Source Limitations: Subject to compliance with requirements, provide cylinders and keying for paracentric and mogul cylinders by same manufacturer as for detention locks and latches.
- B. Paracentric Cylinders: Manufacturer's standard lever-tumbler type, constructed from one-piece spring-tempered brass; with tumblers activated by phosphor bronze springs; five tumblers per lock.
- C. Mogul Cylinders: Manufacturer's standard pin-tumbler type, minimum **2-inch (51-mm)** diameter; body constructed from brass or bronze, stainless steel, or nickel silver; with stainless steel tumblers and engaging cylinder balls; complying with the following:
 - 1. Number of Pins: **[Five][Six][Seven]**.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - a. High-Security Grade: Listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
 - 3. Finish: **[ANSI/BHMA 606][ANSI/BHMA 626][ANSI/BHMA 630]**.
- D. Keying System: Provide a factory-registered keying system complying with the following requirements:
 - 1. Paracentric cylinders operated by change keys only.
 - 2. No Master Key System: Mogul cylinders operated by change keys only.
 - 3. Master Key System: Mogul cylinders operated by a change key and a master key.
 - 4. Grand Master Key System: Mogul cylinders operated by a change key, a master key, and a grand master key.
 - 5. Great-Grand Master Key System: Mogul cylinders operated by a change key, a master key, a grand master key, and a great-grand master key.
 - 6. Existing System: **[Master key or grand master key mogul-cylinder locks to Owner's existing system][Re-key Owner's existing master key system for mogul-cylinder locks into new keying system]**.

- E. Keys: Provide cast silicon-bronze copper alloy keys complying with the following:
1. Stamping: Permanently inscribe each key with a visual key-control number and include the following notation:
 - a. **["DO NOT DUPLICATE"]**[Information to be furnished by Owner]<Insert notation>.
 2. Quantity: In addition to one extra blank key for each lock, provide the following:
 - a. Cylinder Change Keys: **[Three]**<Insert number>.
 - b. Master Key(s): **[One]**<Insert number>.
 - c. Grand Master Key(s): **[One]**<Insert number>.
 - d. Great-Grand Master Key(s): **[One]**<Insert number>.

2.9 SWITCHES

- A. General: Provide switches configured with contact type required for functions indicated, including multiple circuiting where required by functional performance of Section 285213 "Detention Monitoring and Control System and Interfaces."
- B. Concealed, Magnetic Door Position Switches: Consist of actuating magnet mortised into detention door and switch mortised into frame; with stainless steel faceplates; 24 V dc, factory wired with plug connector. Wire in series with lock monitors. Attach with security fasteners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
- C. Concealed, Mechanical Door Position Switches: Consist of metal track mortised into head of detention door connected by steel actuator arm to steel actuator mortised into frame; switch fully concealed when door is in closed position; with stainless steel faceplate; 120 V ac; factory wired with plug connector. Action of door mechanically activates switch. Wire in series with lock monitors. Attach with security fasteners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[RR Brink Locking Systems, Inc.]**

- b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
- D. Surface-Mounted Door Position Switches: Switch enclosed in **0.134-inch (3.42-mm)** nominal-thickness steel enclosure, factory primed for painting; 120 V ac; factory wired with plug connector. Wire in series with lock monitors. Attach with security fasteners.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 3. Galvanize enclosure for exterior locations **[and where indicated]**.
- E. Strike Indicator Switches: Designed to be mortised behind strike and to indicate whether door is locked or unlocked; enclosed in metal strike box. Wire in series with door position switches. Attach with security fasteners.
 1. Voltage: **[120 V dc][240 V ac][As indicated]**.
 2. Locations: **[At doors with mechanical detention lock][Where indicated]**.
 3. Manufacturer: Same as detention lock.
- F. Inmate Door-Control Switches: **[Momentary][Maintained-contact]** push-button switch with metal faceplate. Attach with security fasteners.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[RR Brink Locking Systems, Inc.]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
 3. Material and Finish: **[Brass with ANSI/BHMA 606][Brass with ANSI/BHMA 626][Stainless steel with ANSI/BHMA 630]** finish.
 4. Operation: When activated from remote location, switch allows inmate operation of electric cell door lock.
- G. Push-Button, Inmate Door-Control Switches: **[Momentary][Maintained-contact]** push-button switch for installation without faceplate. Attach with security fasteners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RR Brink Locking Systems, Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 3. Material and Finish: **[Brass with ANSI/BHMA 606][Brass with ANSI/BHMA 626][Stainless steel with ANSI/BHMA 630]** finish.
 4. Operation: When activated from remote location, switch allows inmate operation of electric cell door lock.
- 2.10 DETENTION OPERATING TRIM
- A. Standard: ANSI/BHMA A156.6, Grade 1.
 - B. Surface-Mounted Door Pulls: **8-3/4-inch (222-mm)** overall length and **2-1/4-inch (57-mm)** projection; attach to door with two security fasteners.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Hager Companies]**
 - c. **[RR Brink Locking Systems, Inc.]**
 - d. **[Southern Folger Detention Equipment Company]**

- e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. <Insert manufacturer's name>
3. Material: [Cast bronze with ANSI/BHMA 606 finish][Cast bronze with ANSI/BHMA 626 finish][Cast stainless steel with ANSI/BHMA 630 finish].
- C. Round, Surface-Mounted Door Pulls: 7-inch (178-mm) overall length by 1-inch- (25-mm-) diameter solid bar, with 2-1/4-inch (57-mm) projection; attach to door with two security through bolts.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Hager Companies]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Hager Companies]
 - b. <Insert manufacturer's name>
 3. Material: [Cast or extruded bronze with ANSI/BHMA 606 finish][Cast or extruded bronze with ANSI/BHMA 626 finish][Cast stainless steel with ANSI/BHMA 630 finish].
- D. Flush Door Pulls: 5 inches high by 4 inches wide by 1 inch deep (127 mm high by 102 mm wide by 25 mm deep), with 1/8-inch- (3-mm-) thick faceplate; attach to door with four security fasteners.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]

- b. [Hager Companies]
 - c. [RR Brink Locking Systems, Inc.]
 - d. [Southern Folger Detention Equipment Company]
 - e. <Insert manufacturer's name>
 3. Material: [Formed, wrought, or cast brass/bronze with ANSI/BHMA 606 finish][Formed, wrought, or cast brass/bronze with ANSI/BHMA 626 finish][Formed or cast stainless steel with ANSI/BHMA 630 finish].
 - E. Knob Pulls: **2-inch (51-mm)** diameter; fabricated from solid brass with [ANSI/BHMA 606][ANSI/BHMA 626] finish. Attach with security fasteners.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [RR Brink Locking Systems, Inc.]
 - c. [Southern Folger Detention Equipment Company]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airteq Systems, Inc.; Cornerstone Inc.]
 - b. [RR Brink Locking Systems, Inc.]
 - c. [Southern Folger Detention Equipment Company]
 - d. <Insert manufacturer's name>
 - F. Lever-Handle Guides: Guide tracks [and escutcheons]that provide selective stopping of lever handle by use of an adjustable stop; fabricated from [steel with ANSI/BHMA 633][stainless steel with ANSI/BHMA 630] finish. Attach with security fasteners.
- 2.11 SECURITY DOOR CLOSERS**
- A. Standard: ANSI/BHMA A156.4, Grade 1.
 1. Certified Products: Provide security door closers listed in ANSI/BHMA's "Directory of Certified Door Products."
 - B. Surface-Mounted Security Door Closers:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Corbin Russwin, Inc.; an ASSA ABLOY Group company]
 - b. [LCN; Allegion plc]
 - c. [Norton Door Controls; ASSA ABLOY]
 - d. [Yale Security Inc; ASSA ABLOY]
 - e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Corbin Russwin, Inc.; an ASSA ABLOY Group company]**
 - b. **[LCN; Allegion plc]**
 - c. **[Norton Door Controls; ASSA ABLOY]**
 - d. **[Yale Security Inc; ASSA ABLOY]**
 - e. **<Insert manufacturer's name>**
3. Arms: Minimum **3/8-inch- (9.5-mm-)** thick by **1-1/8-inch- (29-mm-)** wide, rectangular steel main arm; **5/16-inch- (8-mm-)** thick by **1-inch- (25-mm-)** wide, rectangular steel secondary arm; full rack-and-pinion type; fabricated with orbital-riveted, pinned, or welded elbow and arm shoe/soffit plate joints designed to prevent disassembly with ordinary hand tools.
4. Cover: Heavy-duty metal, attached with four security fasteners.
5. Mounting: Attach security door closer with security fasteners.

C. Concealed Security Door Closers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[LCN; Allegion plc]**
 - b. **[Norton Door Controls; ASSA ABLOY]**
 - c. **[SARGENT Manufacturing Company; ASSA ABLOY]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[LCN; Allegion plc]**
 - b. **[Norton Door Controls; ASSA ABLOY]**
 - c. **[SARGENT Manufacturing Company; ASSA ABLOY]**
 - d. **<Insert manufacturer's name>**
3. Construction: Forged-steel arm; security roller; with track concealed in head of detention door, designed to eject foreign objects during opening and closing; fabricated with joints designed to prevent disassembly with ordinary hand tools. Closer arm and track fully concealed when door is closed.
4. Cover Plates: Heavy-duty metal, attached with security fasteners.
5. Provide door position switch integral to closer.

- D. Unit Size: Comply with manufacturer's written recommendations for size of security door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to comply with field conditions and requirements for opening force.

2.12 DETENTION DOOR STOPS

- A. Detention Floor Stops: **1-1/2-inch-high by 2-inch- (38-mm-high by 51-mm-)** diameter, rubber bumper mounted on steel lag bolt; ANSI/BHMA A156.16; install in floor with nonshrink grout; for detention doors unless wall or other type stops are indicated. Do not mount floor stops where they can impede traffic.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Burns Manufacturing Incorporated]**
 - b. **[Hager Companies]**
 - c. **[Trimco]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Burns Manufacturing Incorporated]**
 - b. **[Hager Companies]**
 - c. **[Trimco]**
 - d. **<Insert manufacturer's name>**

- B. Silencers for Detention Door Frames: ANSI/BHMA A156.16, Grade 1; neoprene or rubber, minimum **1/2-inch (13-mm)** diameter; fabricated for drilled-in application to detention door frame. Attach with security fasteners.

2.13 SLIDING DETENTION DOOR DEVICE ASSEMBLIES

- A. Performance Requirements: Provide sliding detention door device assemblies, including locking device, receiver, overhead door hanger, bottom door guide, lock column, and enclosure, as a complete assembly, complying with **[Grade 1][Grade 2]** in accordance with ASTM F1643, as determined by testing manufacturers' standard units representing those indicated for Project.
- B. Assembly Construction:
 1. Enclosure: Fabricated from **0.179-inch (4.56-mm)** nominal-thickness steel plate, with **0.134-inch (3.42-mm)** nominal-thickness steel **[removable][hinged]** cover. Baffle openings in enclosure. Provide closures for ends of housings.
 - a. Provide sloping-top housings. **[Flat-top housings may be provided for operators mounted to ceiling.]**
 2. Lock Column: Vertical tube enclosure fabricated from **0.134-inch (3.42-mm)** nominal-thickness steel, providing mechanical locking control of detention sliding door at door location; operated by paracentric key. Doors are capable of being locked at top and bottom, at rear of door, in both open and closed positions, with no components projecting into door opening.
 3. Receiver: Fabricated from **0.134-inch (3.42-mm)** nominal-thickness steel plate.
 4. Hanger Assembly: Extend steel carrier full width of door plus full extent of door travel required for clear door opening. Provide antifriction ball-bearing steel rollers with hardened members and grease shield.
 5. Finish: Factory prime painted.
- C. Mechanical-Locking, Manual-Door-Movement, Sliding-Door Device Assemblies: Doors are manually opened and closed and mechanically locked by means of jamb-mounted mechanical detention lock specified elsewhere in this Section.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
- b. [Maximum Security Products Corp]
- c. [RR Brink Locking Systems, Inc.]
- d. [Southern Folger Detention Equipment Company]
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
- b. [Maximum Security Products Corp]
- c. [RR Brink Locking Systems, Inc.]
- d. [Southern Folger Detention Equipment Company]
- e. <Insert manufacturer's name>

- D. Electromechanical-Locking, Manual-Door-Movement, Sliding-Door Device Assemblies: Operated from remote-control panel that activates electric motors to unlock sliding doors. Doors spring open a small distance after unlocking and are manually opened and closed. Locks automatically deadlock when doors are moved to fully open or fully closed position. Provide factory-wired cable harness with plug connectors for each motor unit.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
- b. [RR Brink Locking Systems, Inc.]
- c. [Southern Folger Detention Equipment Company]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Airteq Systems, Inc.; Cornerstone Inc.]
- b. [RR Brink Locking Systems, Inc.]
- c. [Southern Folger Detention Equipment Company]
- d. <Insert manufacturer's name>

- 3. Single-Door Function: In an emergency or if power fails, individual doors can be unlocked using a manual-release tool and manually moved; doors relock in either fully open or fully closed position.
- 4. Multiple-Door Function: Each door can be individually unlocked locally or from a remote panel, or unlocked from a remote panel with other doors as a group. In an emergency or if power fails, door group can be manually operated from [mechanical-release cabinet at end of cell line][pilaster release adjacent to receiving jamb of each door operated by paracentric key]; doors do not relock in any position.
- 5. Electric Key Switch: Operated by [paracentric][mogul] key and provides electric control of detention sliding-door operation at door location.

- E. Electromechanical-Locking, Electromechanical-Door-Movement, Sliding-Door Device Assemblies:

Operated from remote-control panel that activates electric motors to unlock sliding doors and motorized rack-and-pinion drive mechanisms to open and close doors. Doors lock in open position and deadlock when closed. Provide factory-wired cable harness with plug connectors for each motor unit.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[RR Brink Locking Systems, Inc.]**
 - d. **[Southern Folger Detention Equipment Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[RR Brink Locking Systems, Inc.]**
 - d. **[Southern Folger Detention Equipment Company]**
 - e. **<Insert manufacturer's name>**
 3. Single-Door Function: In an emergency or if power fails, individual doors can be unlocked using a manual-release tool and manually moved; doors relock in either fully open or fully closed position.
 4. Multiple-Door Function: Each door can be individually unlocked locally or from a remote panel, or unlocked from a remote panel with other doors as a group. In an emergency or if power fails, door group can be manually operated from **[mechanical-release cabinet at end of cell line][pilaster release adjacent to receiving jamb of each door operated by paracentric key]**; doors do not relock in any position.
 5. Electric Key Switch: Operated by **[paracentric][mogul]** key and provides electric control of detention sliding-door operation at door location.
- F. Pneumatic-Locking, Manual-Door-Movement, Sliding-Door Device Assemblies: Operated from remote-control panel that activates pneumatic cylinders to unlock doors. Doors spring open a small distance after unlocking and are manually opened and closed. Locks automatically deadlock when doors are moved to fully open or fully closed position. Factory install quick-connect air fitting and factory-wired cable harness with plug connectors for each motor unit.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**

- c. <Insert manufacturer's name>
 3. Single-Door Function: In an emergency or if pneumatic systems or electric power fails, individual doors can be unlocked using a manual-release tool and manually moved; doors relock in either fully open or fully closed position.
 - a. Lock Control at Door: Mechanical key release adjacent to receiving jamb of each door, contained in pilaster and operated by paracentric key.
 4. Multiple-Door Function: Each door can be individually unlocked locally or from a remote panel, or unlocked from a remote panel with other doors as a group. In an emergency or if pneumatic systems or electric power fails, door group can be operated from **[remotely located auxiliary pneumatic-release system][pilaster release adjacent to receiving jamb of each door operated by paracentric key]**; doors do not relock in any position.
 5. Electric Key Switch: Operated by **[paracentric][mogul]** key and providing electric control of detention sliding-door operation at door location.
- G. Pneumatic-Locking, Pneumatic-Door-Movement, Sliding-Door Device Assemblies: Operated from remote-control panel that activates pneumatic cylinder to unlock sliding doors and open and close doors. Doors lock in open position and deadlock when closed. Factory install quick-connect air fitting and factory-wired cable harness with plug connectors for each motor unit; 24 V dc.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert **manufacturer's name; product name or designation**> or comparable product by one of the following:
 - a. **[Airteq Systems, Inc.; Cornerstone Inc.]**
 - b. **[Southern Folger Detention Equipment Company]**
 - c. <Insert manufacturer's name>
 3. Single-Door Function: In an emergency or if pneumatic systems or electric power fails, individual doors can be unlocked using a manual-release tool and manually moved; doors relock in either fully open or fully closed position.
 4. Multiple-Door Function: Each door can be individually unlocked locally or from a remote panel, or unlocked from a remote panel with other doors as a group. In an emergency or if pneumatic systems or electric power fails, door group can be operated from **[remotely located auxiliary pneumatic-release system][pilaster release adjacent to receiving jamb of each door operated by paracentric key]**; doors do not relock in any position.
 5. Electric Key Switch: Operated by **[paracentric][mogul]** key and providing electric control of detention sliding-door operation at door location.
 6. Provide security ring for installation of pneumatic detention lock in hollow-metal detention frame, welded to frame or access cover.

2.14 KEY-CONTROL SYSTEM

- A. Security Key Cabinets: Metal cabinet for mounting [150][300]<Insert number> paracentric or mogul keys.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[Detention Device Systems (DDS); DDS Group]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Detention Device Systems (DDS); DDS Group]**
 - c. **[Southern Folger Detention Equipment Company]**
 - d. **<Insert manufacturer's name>**
 3. Cabinet: Minimum **16 inches (406 mm)** wide by **24 inches (610 mm)** high by **6-1/2 inches (165 mm)** deep; formed from **0.134-inch (3.42-mm)** nominal-thickness steel sheet. Provide **0.060-inch (1.52-mm)** nominal-thickness, steel-sheet interior panels, supported on pivots.
 4. Doors: Formed from same material as cabinet, supported by heavy-duty, continuous, side hinge welded to cabinet and door; with tumbler deadlock.
 5. Cross-Index System: Set up by detention key-control manufacturer; include labels, two sets of key tags with self-locking key holders, key-gathering envelopes, temporary and permanent markers, and the following:
 - a. Card Index: Furnish four sets of index cards for recording key information. Include three receipt forms for each key-holding hook.
 - b. Computer Software: Furnish cross-index software for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.
- B. Finishes:
1. Steel Prime Finish: Clean, pretreat, and apply manufacturer's standard primer immediately after cleaning and pretreating.
 2. Steel Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.15 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated

labels and as otherwise approved by Architect.

- B. Base Metals: Produce detention door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified detention door hardware units and ANSI/BHMA A156.18 finishes.
- C. Fasteners: Provide flat-head security fasteners with finished heads to match surface of detention door hardware.
 - 1. Security Fasteners: Fabricate detention door hardware using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials. [**Provide stainless steel security fasteners in stainless steel materials.**]
 - 2. Concealed Fasteners: For detention door hardware units that are exposed when detention door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching detention door hardware. Where using through bolts on hollow-metal detention door and frame construction, provide sleeves for each through bolt.
 - 3. Steel Machine Screws: For the following fire-rated applications:
 - a. Mortise detention hinges to detention doors.
 - b. Strike plates to detention frames.
 - c. Security door closers to detention doors and frames.
 - 4. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface detention hinges to detention doors.
 - b. Security door closers to detention doors and frames.
 - 5. Spacers Bolts: For through bolting of hollow-metal detention doors.
- D. Detention Lock Construction: Fabricate detention lock case and cover plate from steel plate. Fabricate bolts from solid sections; laminated construction is unacceptable.

2.16 HARDWARE FINISHES

- A. Standard: Comply with ANSI/BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. ANSI/BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. ANSI/BHMA 600: Primed for painting, over steel base metal.
 - 2. ANSI/BHMA 606: Satin brass, clear coated, over brass base metal.
 - 3. ANSI/BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 4. ANSI/BHMA 630: Stainless steel, satin, over stainless steel base metal.
 - 5. ANSI/BHMA 633: Satin brass plated, clear coated, over steel base metal.
 - 6. ANSI/BHMA 652: Satin chromium plated over nickel, over steel base metal.

2.17 SECURITY FASTENERS

- A. Security Fasteners: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific fastener type. Provide drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**
 - d. **[Tamper-Pruf Screws]**
 - e. **[Tamperproof Screw Co., Inc.]**
 - f. **<Insert manufacturer's name>**
 3. Drive-System Type: **[Pinned Torx-Plus][Pinned Torx]<Insert system>**.
 4. Fastener Strength: **120,000 psi (827 MPa)**.
 5. Socket Button Head Fasteners:
 - a. Heat-treated alloy steel, **ASTM F835**.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 6. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, **ASTM F835**.
 - b. Stainless steel, **ASTM F879 (ASTM F879M)**, Group 1 CW.
 7. Socket Head Cap Fasteners:
 - a. Heat-treated alloy steel, **ASTM A574**.
 - b. Stainless steel, **ASTM F837 (ASTM F837M)**, Group 1 CW.
 8. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137/F1137M, Grade I, or black oxide unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine detention doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention door hardware connections before detention door hardware installation.
- C. Inspect built-in and cast-in anchor installations, before installing detention door hardware, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work.
- D. Verify locations of detention door hardware with those indicated on Shop Drawings.
- E. Examine roughing-in for electrical power[**and pneumatic**] systems to verify actual locations of connections before detention door hardware installation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Detention Doors and Frames: Comply with ANSI/BHMA A156.115 Series.
 - 1. Surface-Applied Detention Door Hardware: Drill and tap detention doors and frames in accordance with ANSI/SDI A250.6.

3.3 INSTALLATION OF DETENTION DOOR HARDWARE

- A. Mounting Heights: Mount detention door hardware units at heights indicated in [**DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames"**]<Insert standard>.
- B. Install each detention door hardware item to comply with Shop Drawings and manufacturer's written instructions. Where cutting and fitting are required to install detention door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- C. Hinge Installation:
 - 1. Welding: Where indicated, weld hinges to detention doors and frames with continuous fillet weld

- around three sides of hinge perimeter.
2. Security Fasteners: Provide socket flat countersunk head machine screws; finish screw heads to match surface of detention hinges. Install into drilled and tapped holes.
 - D. Install interconnecting wiring and connectors between detention door hardware devices. Terminate device wiring for detention door hardware installed in **[swinging doors at a plug-type connector located in lock pocket or door frame junction box]****[and for]****[sliding doors at a junction box in door frame]**.
 - E. Security Fasteners: Install detention door hardware using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Tests and inspections:
 1. After installing electrically powered ~~and pneumatic~~ detention door hardware and after electrical circuitry has been energized ~~and compressed-air system is functional~~, test detention door hardware for compliance with requirements.
 - a. Test: Operate lock of each door and group of doors in normal remote, normal local, and emergency operating modes. Verify that remote controls operate correct door locks and in correct sequence.
 2. Verify that lock bolts engage strikes with required bolt projection.
 3. Verify that detention door hardware is installed, connected, and adjusted in accordance with the Contract Documents.
 4. Verify that electrical wiring installation complies with manufacturer's submittal and written installation requirements.
- C. Detention work will be considered defective if it does not pass tests and inspections.
- D. Perform additional inspections to determine compliance of replaced or additional work.
- E. Prepare field quality-control certification~~, endorsed by Detention Specialist,~~ that states installed products comply with requirements in the Contract Documents.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust and check each operating item of detention door hardware and each detention door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust detention door-control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

11 - Equipment

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by detention door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that detention door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, provide **[three][six][nine][12]<Insert number>** months' full maintenance by skilled employees of detention door hardware Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper detention door hardware operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

3.8 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain detention door hardware and detention door hardware finishes.

3.9 DETENTION DOOR HARDWARE SCHEDULE

- A. General: Provide detention door hardware for each detention door to comply with requirements in this Section and with detention door hardware sets indicated below.

END OF SECTION 11 98 14 00

SECTION 11 98 21 00 - DETENTION WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Awning detention windows.
2. Casement detention windows.
3. Fixed detention windows.
4. Air-vent detention windows.

B. Related Requirements:

1. Section 085653 "Security Windows" for forced-entry- and ballistics-resistant window assemblies, including transaction windows.
2. Section 099113 "Exterior Painting" for field painting exterior detention windows.
3. Section 119812 "Detention Doors and Frames" for detention-grade hollow-metal sidelights and borrowed lights.

1.2 COORDINATION

- A. Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B. Coordinate installation of anchorages for detention windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in **[concrete][or][masonry]**. Deliver such items to Project site as required to prevent delaying the Work.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention windows.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for

- each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration: For each product.
12. Health Product Declaration: For each product.
13. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
14. Environmental Product Declaration: For each product.
15. Environmental Product Declaration: For each product.
16. Environmental Product Declaration: For each product.
17. Third-Party Certifications: For each product.
18. Third-Party Certified Life Cycle Assessment: For each product.
19. Product Data: For sealants, indicating VOC content.
20. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For detention windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including [detention bars,][screens,] reinforcement and stiffeners.
3. Location of weep holes.
4. Hardware, including operators.
5. Glazing details.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Main Framing Member: **12-inch- (305-mm-)** long, full-size sections with factory-applied color finish.
2. Window Corner Fabrication: **12-by-12-inch- (305-by-305-mm-)** long, full-size window corner including full-size sections with factory-applied color finish, weather stripping, and glazing.
3. Operable Window: Full-size unit with factory-applied finish.
4. Hardware: Full-size units with factory-applied finishes.
5. Weather Stripping: **12-inch- (305-mm-)** long sections.
6. **<Insert component>: <Insert description>.**

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][and][testing agency].
- B. Welding certificates.

- C. Material Certificates: For homogeneous tool-resisting steel indicating compliance with performance requirements for complete test sequence in accordance with applicable ASTM standard.
- D. Material Test Reports: For homogeneous tool-resisting steel.
- E. Product Test Reports: For each type of detention window, for tests performed by a qualified testing agency.
- F. Examination reports documenting inspections of substrates, areas, and conditions.
- G. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- H. Field quality-control reports.
 - 1. Field quality-control certification signed by Contractor[**and Detention Specialist**].
- I. Sample Warranties: For manufacturer's special warranties.

1.6 SEQUENCING

- A. Field Painting: Except where detention windows have been preglazed before installation, complete field painting of window units before glazing installation.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
 - 2. Tools: Provide [**two**]**<Insert number>** sets of tools for installing and removing security fasteners.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace detention windows that fail in materials or

workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including deflections exceeding **1/4 inch (6 mm)**.
 - b. Failure of welds.
 - c. Lateral deflection of glass lite edges in excess of 1/175.
 - d. Excessive air leakage.
 - e. Excessive water penetration.
 - f. Faulty operation of ventilators and hardware.
 - g. Deterioration of metals, metal finishes, and other materials beyond normal weathering and detention use.
 - h. **<Insert failure modes>**.
2. Warranty Period: **[Three]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]<Insert value>** percent.
- B. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Attack Resistance: **[Grade 1][Grade 2][Grade 3][Grade 4]** when tested in accordance with ASTM F1592.
 1. Ballistics Resistance: Test glazed window assembly for bullet penetration in accordance with UL 752, Performance Level 3.
 2. Dual Certification: Provide window assemblies with **[Grade 1][Grade 2][Grade 3][Grade 4]** glazing panels, when tested in accordance with ASTM F1915.
- H. Structural Loads: Detention windows shall withstand the effects of wind loads, with no permanent

deformation or breakage of components within window assembly when tested in accordance with ASTM E330/E330M.

1. Wind Loads: As indicated on Drawings.

I. Air Leakage:

1. Fixed Windows: Maximum air leakage through fixed glazing and framing areas of [0.06 cfm/sq. ft. (0.03 L/s per sq. m)]<Insert value> at a static-air-pressure differential of [1.57 lbf/sq. ft. (75 Pa)][6.24 lbf/sq. ft. (300 Pa)]<Insert value> when tested in accordance with ASTM E283.
2. Operable Windows: Maximum air leakage of [0.37 cfm/ft. (0.18 L/s per m)]<Insert value> of sash crack length at an inward test pressure of [1.57 lbf/sq. ft. (75 Pa)][6.24 lbf/sq. ft. (298 Pa)]<Insert value> when tested in accordance with ASTM E283.

J. Water Penetration under Static Pressure:

1. Fixed Windows: No evidence of water penetration through fixed glazing and framing areas when tested in accordance with ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than [6.24 lbf/sq. ft. (300 Pa)]<Insert value>.
2. Operable Windows: No evidence of water penetration through operable units for 15 minutes when window is subjected to a rate of flow of 5 gal./h per sq. ft. (0.05 L/s per sq. m) with a differential pressure across the window of [2.86 lbf/sq. ft. (137 Pa)][6.24 lbf/sq. ft. (298 Pa)] when tested in accordance with ASTM E331.

K. Energy Performance: Provide windows with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below[**and certified and labeled according to NFRC**]:

1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than [0.80 Btu/sq. ft. x h x deg F (4.54 W/sq. m x K)][0.65 Btu/sq. ft. x h x deg F (3.69 W/sq. m x K)]<Insert value> as determined in accordance with NFRC 100.
2. Solar Heat-Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a SHGC of no greater than [0.6][0.7]<Insert value> as determined in accordance with NFRC 200.

L. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [1][2][3][4] for [basic][enhanced] protection.

1. Large-Missile Test: For glazing located within [30 feet (9.1 m)]<Insert dimension> of grade.
2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and [60 feet (18.3 m)]<Insert dimension> above grade.

2.2 AWNING DETENTION WINDOWS

A. Steel Framing, Awning Detention Windows: Fabricate perimeter framing, removable covers, and ventilator head rails from 0.105-inch (2.66-mm) nominal-thickness, [metallic-coated,] cold-rolled steel sheet; ventilator jamb and sill framing from hot-rolled steel sections weighing not less than 1.93 lb/linear foot (2.87 kg/linear m); and 0.055-inch- (1.40-mm-) thick glazing stops from extruded aluminum.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Hope's Windows, Inc.]
- b. [Optimum Window Mfg Corp]

- c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Hope's Windows, Inc.]
 - b. [Optimum Window Mfg Corp]
 - c. <Insert manufacturer's name>
- B. Stainless Steel Framing, Awning Detention Windows: Fabricate perimeter framing and glazing stops from [0.109-inch (2.78-mm)][0.078-inch (1.98-mm)] nominal thickness, stainless steel sheet; and muntins and operable sash members from extruded aluminum.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CM Security Group Inc.]
 - b. [Hope's Windows, Inc.]
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CM Security Group Inc.]
 - b. [Hope's Windows, Inc.]
 - c. <Insert manufacturer's name>
- C. Aluminum Framing, Awning Detention Windows: Fabricate perimeter framing, removable covers, [muntins,][mullions,] and glazing stops from extruded aluminum.[Provide thermally broken construction.]
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CM Security Group Inc.]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CM Security Group Inc.]
 - b. <Insert manufacturer's name>
- D. Detention Bars:
 1. Tool-Resisting-Steel Bar Grid: [1-inch- (25-mm-)][7/8-inch- (22-mm-)] diameter, tool-resisting-steel, round bars concealed within muntins at [center of window][6 inches (152 mm) o.c.]<Insert spacing>, oriented along length of window unless otherwise indicated, with [3/8-by-

2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)] tool-resisting-steel, flat bars concealed within perimeter frame.

- a. Composite, Tool-Resisting Steel: **[Grade 1][Grade 2]** in accordance with ASTM A627.
- b. Homogeneous, Tool-Resisting Steel: **[Grade 3][Grade 4]** in accordance with ASTM A627.

2. Mild-Steel Detention Bar Grid: **[1-inch- (25-mm-)][7/8-inch- (22-mm-)]** diameter, mild-steel round bars concealed within muntins at **[center of window][6 inches (152 mm) o.c.]<Insert spacing>**, oriented along length of window unless otherwise indicated, with **[3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)]** mild-steel, flat bars concealed within perimeter frame.

E. Hardware:

1. Four-Bar Friction Hinges: Provide adjustable friction shoes of bronze, brass, nylon, or other nonabrasive, nonstaining, noncorrosive, durable material.
2. Gear-Type, Rotary, Ventilator Operators: Manufacturer's security-grade ventilator control; consisting of manual operator with worm gear, self-locking, bronze bearings, and steel linkage arms on both jambs; maximum opening of 50 degrees, with **[nonremovable operable knob][removable crank]**.
 - a. Operator shall turn all ventilators simultaneously, securely closing them at both jambs without using additional manually controlled locking devices.
 - b. Conceal operator, which shall be removable as a unit, within subframe.
 - c. Provide one removable crank for every **[10]<Insert number>** windows.

F. Screens:

1. Fixed Angle-Frame Screens: Fabricate angle frames and removable clamp strips from **[0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel][0.078-inch- (1.98-mm-) thick stainless steel]**. Match window-frame finish.
2. Fixed Tube-Frame Screens: Fabricate tubular frames from **3/4-by-1-1/2-by-0.083-inch (19-by-38-by-2.1-mm)** steel tubing. Match window-frame finish.
3. Wire-Fabric Screen Cloth: Manufacturer's standard mesh of **0.047-inch- (1.19-mm-)** diameter, stainless steel wire, complying with FS RR-W-365A.

G. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

H. Materials:

1. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
4. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
5. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
6. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
7. Tool-Resisting-Steel Bars: ASTM A627.
8. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.

2.3 CASEMENT DETENTION WINDOWS

- A. Steel Framing, Casement Detention Windows: Fabricate perimeter framing and removable covers from **0.105-inch (2.66-mm)** nominal-thickness, **[metallic-coated,]** cold-rolled steel sheet; ventilator head, jamb, and sill framing from hot-rolled steel sections weighing not less than **1.93 lb/linear foot (1.3 kg/linear m)**; vertical muntins from **0.120-inch (3.04-mm)** nominal-thickness, **[metallic-coated,]** cold-rolled steel sheet; ventilator bedding angles from **0.060-inch (1.52-mm)** nominal-thickness, **[metallic-coated,]** cold-rolled steel sheet; and **0.055-inch- (1.40-mm-)** thick glazing stops from extruded aluminum.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Hope's Windows, Inc.]**
 - b. **[Optimum Window Mfg Corp]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hope's Windows, Inc.]**
 - b. **[Optimum Window Mfg Corp]**
 - c. **<Insert manufacturer's name>**
- B. Stainless Steel Framing, Casement Detention Windows: Fabricate perimeter framing and glazing stops from **[0.109-inch (2.78-mm)][0.078-inch (1.98-mm)]** nominal-thickness, stainless steel sheet; and vertical muntins and ventilator framing from extruded aluminum.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[CM Security Group Inc.]**
 - b. **[Hope's Windows, Inc.]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CM Security Group Inc.]**
 - b. **[Hope's Windows, Inc.]**
 - c. **<Insert manufacturer's name>**
- C. Detention Bars:
1. Tool-Resisting-Steel Bar Grid: **[1-inch- (25-mm-)][7/8-inch- (22-mm-)]** diameter, tool-resisting-steel, round bars concealed within muntins at **[center of window][6 inches (152 mm) o.c.]<Insert spacing>**, oriented along length of window unless otherwise indicated, with **[3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)]** tool-resisting-steel, flat bars concealed within perimeter frame.

- a. Composite, Tool-Resisting Steel: **[Grade 1][Grade 2]** in accordance with ASTM A627.
 - b. Homogeneous, Tool-Resisting Steel: **[Grade 3][Grade 4]** in accordance with ASTM A627.
 2. Mild-Steel Detention Bar Grid: **[1-inch- (25-mm-)][7/8-inch- (22-mm-)]** diameter, mild-steel, round bars concealed within muntins at **[center of window][6 inches (152 mm) o.c.]<Insert spacing>**, oriented along length of window unless otherwise indicated, with **[3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)]** mild-steel, flat bars concealed within perimeter frame.
- D. Hardware:
1. Four-Bar Friction Hinges: Provide adjustable friction shoes of bronze, brass, nylon, or other nonabrasive, nonstaining, noncorrosive, durable material.
 2. Gear-Type, Rotary, Ventilator Operators: Manufacturer's security-grade ventilator control; consisting of manual operator with worm gear, self-locking, bronze bearings, and steel linkage arms on both jambs; maximum opening of 50 degrees, with **[nonremovable operable knob][removable crank]**.
 - a. Operator shall turn all ventilators simultaneously, securely closing them at both jambs without using additional manually controlled locking devices.
 - b. Conceal operator, which shall be removable as a unit, within subframe.
 - c. Provide one removable crank for every **[10]<Insert number>** windows.
- E. Screens:
1. Fixed Angle-Frame Screens: Fabricate angle frames and removable clamp strips from **[0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel][0.078-inch- (1.98-mm-) thick stainless steel]**. Match window-frame finish.
 2. Fixed Tube-Frame Screens: Fabricate tubular frames from **3/4-by-1-1/2-by-0.083-inch (19-by-38-by-2.1-mm)** steel tubing. Match window-frame finish.
 3. Wire-Fabric Screen Cloth: Manufacturer's standard mesh of **0.047-inch- (1.19-mm-)** diameter, stainless steel wire, complying with FS RR-W-365A.
- F. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."
- G. Materials:
1. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
 3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 4. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
 5. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
 6. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
 7. Tool-Resisting-Steel Bars: ASTM A627.
 8. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.

2.4 FIXED DETENTION WINDOWS

- A. Steel Framing, Fixed Detention Windows: Fabricate perimeter framing, removable covers, and **[muntins][mullions]** from **0.105-inch (2.66-mm)** nominal-thickness, **[metallic-coated,]** cold-rolled steel sheet. **[Provide thermally improved construction.][Provide thermally broken construction.]**
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Hope's Windows, Inc.]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hope's Windows, Inc.]**
 - b. **<Insert manufacturer's name>**
- B. Stainless Steel Framing, Fixed Detention Windows: Fabricate perimeter framing and removable covers from **[0.109-inch (2.78-mm)][0.078-inch (1.98-mm)]** nominal-thickness, stainless steel sheet; glazing stops and muntins from **0.078-inch (1.98-mm)** nominal-thickness, stainless steel sheet; and muntins from **[0.078-inch (1.98-mm) nominal-thickness, stainless steel sheet][extruded aluminum].** **[Provide thermally improved construction.][Provide thermally broken construction.]**
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[CM Security Group Inc.]**
 - b. **[Hope's Windows, Inc.]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CM Security Group Inc.]**
 - b. **[Hope's Windows, Inc.]**
 - c. **<Insert manufacturer's name>**
- C. Detention Bars:
 1. Tool-Resisting-Steel Bar Grid: **[1-inch- (25-mm-)][7/8-inch- (22-mm-)]** diameter, tool-resisting-steel, round bars concealed within muntins at **[center of window][6 inches (152 mm) o.c.]<Insert spacing>**, oriented along length of window unless otherwise indicated, with **[3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)]** tool-resisting-steel, flat bars concealed within perimeter frame.
 - a. Composite, Tool-Resisting Steel: **[Grade 1][Grade 2]** in accordance with ASTM A627.
 - b. Homogeneous, Tool-Resisting Steel: **[Grade 3][Grade 4]** in accordance with ASTM A627.

2. Mild-Steel Detention Bar Grid: [1-inch- (25-mm-)][7/8-inch- (22-mm-)] diameter, mild-steel, round bars concealed within muntins at **[center of window][6 inches (152 mm) o.c.]<Insert spacing>**, oriented along length of window unless otherwise indicated, with **[3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)]** mild-steel, flat bars concealed within perimeter frame.
- D. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."
- E. Materials:
 1. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
 3. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **[Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>**.
 5. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
 6. Tool-Resisting-Steel Bars: ASTM A627.

2.5 AIR-VENT DETENTION WINDOWS

- A. Steel Framing, Air-Vent Detention Windows: Fabricate perimeter framing, removable covers, integral perforated grille, ventilator frame, vent damper, and **[muntins][mullions]** from **0.105-inch (2.66-mm)** nominal-thickness, **[metallic-coated,]** cold-rolled steel sheet; and glazing stops from **0.060-inch- (1.5-mm-)** thick, extruded aluminum. **[Provide 10-by-10 (2.5-by-2.5-mm) stainless steel mesh behind perforated grille.]**
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hope's Windows, Inc.]**
 - b. **[Optimum Window Mfg Corp]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hope's Windows, Inc.]**
 - b. **[Optimum Window Mfg Corp]**
 - c. **<Insert manufacturer's name>**
- B. Stainless Steel Framing, Air-Vent Detention Windows: Fabricate perimeter framing, removable covers, integral perforated grille, ventilator frame, and vent damper from **[0.109-inch (2.78-mm)][0.078-inch (1.98-mm)]** nominal-thickness, stainless steel sheet; glazing stops from **0.078-inch (1.98-mm)** nominal-thickness, stainless steel sheet; and muntins from **[0.078-inch (1.98-mm) nominal-thickness, stainless steel sheet][extruded aluminum]**.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [CM Security Group Inc.]
- b. [Hope's Windows, Inc.]
- c. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [CM Security Group Inc.]
- b. [Hope's Windows, Inc.]
- c. <Insert manufacturer's name>

C. Detention Bars:

- 1. Tool-Resisting-Steel Bar Grid: [1-inch- (25-mm-)][7/8-inch- (22-mm-)] diameter, tool-resisting-steel, round bars concealed within muntins at [center of window][6 inches (152 mm) o.c.]<Insert spacing>, oriented along length of window unless otherwise indicated, with [3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)] tool-resisting-steel, flat bars concealed within perimeter frame.
 - a. Composite, Tool-Resisting Steel: [Grade 1][Grade 2] in accordance with ASTM A627.
 - b. Homogeneous, Tool-Resisting Steel: [Grade 3][Grade 4] in accordance with ASTM A627.
- 2. Mild-Steel Detention Bar Grid: [1-inch- (25-mm-)][7/8-inch- (22-mm-)] diameter, mild-steel, round bars concealed within muntins at [center of window][6 inches (152 mm) o.c.]<Insert spacing>, oriented along length of window unless otherwise indicated, with [3/8-by-2-1/2-inch (9.6-by-63.5-mm)][5/16-by-2-1/4-inch (7.9-by-57.2-mm)][1/4-by-2-inch (6-by-50-mm)] mild-steel, flat bars concealed within perimeter frame.

D. Hardware:

- 1. Gear-Type, Rotary, Ventilator Operators: Manufacturer's security-grade ventilator control; consisting of manual operator with worm gear, self-locking, bronze bearings, and steel linkage arms on both jambs; maximum opening of 50 degrees, with [nonremovable operable knob][removable crank].
 - a. Operator shall turn all ventilators simultaneously, securely closing them at both jambs without using additional manually controlled locking devices.
 - b. Conceal operator, which shall be removable as a unit, within subframe.
 - c. Provide one removable crank for every [10]<Insert number> windows.

E. Screens:

- 1. Fixed Angle-Frame Screens: Fabricate angle frames and removable clamp strips from [0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel][0.078-inch- (1.98-mm-) thick stainless steel]. Match window-frame finish.
- 2. Fixed Tube-Frame Screens: Fabricate tubular frames from 3/4-by-1-1/2-by-0.083-inch (19-by-38-by-2.1-mm) steel tubing. Match window-frame finish.
- 3. Wire-Fabric Screen Cloth: Manufacturer's standard mesh of 0.047-inch- (1.19-mm-) diameter, stainless steel wire, complying with FS RR-W-365A.

F. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

G. Materials:

1. Mild-Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with **G60 (Z180)** zinc (galvanized) or **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating designation.
4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, [**Type 304**][**Type 316**][**Type 304 or 316 as indicated**]<Insert type>.
5. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
6. Tool-Resisting-Steel Bars: ASTM A627.
7. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.

2.6 FABRICATION

- A. General: Fabricate detention windows to provide a complete system for assembly of components and anchorage of window units.
 1. Provide units that are reglazable from the exterior without dismantling ventilator framing.
 2. Fabricate detention window frames of one-piece construction[, **except where removable covers are indicated**].
 3. Form removable covers to profiles indicated on Drawings.
- B. Anchors for In-Place-Construction Installation: **3/16-inch- (4.8-mm-)** thick steel angles or formed-steel plates, **4 inches (100 mm)** long, welded to back of detention window frames as required to secure detention windows to adjacent construction.
 1. Provide two anchors per side of window plus one additional anchor for every **18 inches (457 mm)** or fraction thereof more than **36 inches (914 mm)** in height or width.
- C. Anchors for Built-in Installation: **1/2-inch- (13-mm-)** diameter, headed studs welded to back side of frames as required to secure detention windows to adjacent construction.
 1. Provide two anchors per side of window plus one additional anchor for every **18 inches (457 mm)** or fraction thereof more than **36 inches (914 mm)** in height or width.
- D. Glazing Stop Heights: Minimum **1.25 inches (32 mm)** to provide minimum **1-inch (25-mm)** glass engagement.
- E. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.
- F. Thermally Improved or Thermally Broken Construction: Fabricate framing with an integral, concealed, low-conductance thermal barrier, located between exterior materials and members exposed on interior in a manner that eliminates direct metal-to-metal contact. Attach with security fasteners.
- G. Window and Screen Frames: Miter or cope corners the full depth of frame; weld and dress smooth.
- H. Detention Bars: Fabricate flat bar perimeter frame to allow round bars to penetrate and create a secure grid.[**Weld round bars to back side of flat bars.**] Conceal detention bars within window framing.
- I. Muntins: Attach muntins to perimeter framing with concealed welds.[**Use security fasteners for aluminum muntins.**]

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- J. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- K. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- L. Preglazed Fabrication: Preglaze window units at factory. Installation orientation of glazing to meet performance requirements. Comply with requirements in Section 088853 "Security Glazing."
- M. Glazing Stops: Provide glazing stops applied with security fasteners or rivets and coordinated with glazing indicated. Finish glazing stops to match window units.
- N. Weather Stripping: Factory applied.
- O. Security Screens: Secure screen to frame with security fasteners or stainless steel rivets.
- P. Security Fasteners: Fabricate detention windows using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. **[Provide stainless steel security fasteners in stainless steel materials.]**

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: **[Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.**
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
- D. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with **[AAMA 2604][AAMA 2605]** and containing not less than **[50][70]** percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- E. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- F. Superior-Performance Organic Finish, Four-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions **[for seacoast and severe environments]**.
 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- G. Superior Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- H. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- 2.9 METALLIC-COATED STEEL SHEET FINISHES
- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the coating to be applied over it.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.10 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with **[SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"]**[or]**[SSPC-SP 8, "Pickling"]**<Insert surface preparation method>.[**After cleaning, apply a conversion coating suited to the organic coating to be applied over it.**]
- B. Galvanizing: After fabrication, galvanize window components by chemical cleaning complying with SSPC-SP 1, "Solvent Cleaning," and pickling treatment complying with SSPC-SP 8, "Pickling," followed by hot-dip galvanizing complying with ASTM A123/A123M.
- C. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- D. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1. Color and Gloss: **[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]**<Insert color and gloss>.

2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces.
 - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Sheet and Plate Finishes:
 - 1. Cold-Rolled, Bright Finish: ASTM A480/A480M, No. 2B.
 - 2. Directional Satin Finish: ASTM A480/A480, No. 4.
 - 3. High-Luster Finish: ASTM A480/A480M, No. 7.

2.12 SECURITY FASTENERS

- A. Security Fasteners: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**
 - c. **[Safety Socket LLC]**

- d. [Tamper-Pruf Screws]
 - e. [Tamperproof Screw Co., Inc.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]
 - b. [Bryce Fastener Mfg., Inc.]
 - c. [Safety Socket LLC]
 - d. [Tamper-Pruf Screws]
 - e. [Tamperproof Screw Co., Inc.]
 - f. <Insert manufacturer's name>
 3. Drive-System Type: [Pinned Torx-Plus][Pinned Torx]<Insert system>.
 4. Fastener Strength: 120,000 psi (827 MPa).
 5. Socket Button Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
 6. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
 7. Socket Head Cap Fasteners:
 - a. Heat-treated alloy steel, ASTM A574.
 - b. Stainless steel, ASTM F837 (ASTM F837M), Group 1 CW.
 8. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.13 SECURITY SEALANTS

- A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.
 1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical

6. Emissions from Indoor Sources Using Environmental Chambers." Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
7. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Master Builders Solutions]**
 - b. **[Pecora Corporation]**
 - c. **<Insert manufacturer's name>**
8. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Master Builders Solutions]**
 - b. **[Pecora Corporation]**
 - c. **<Insert manufacturer's name>**

- B. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.
 1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
 7. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**

8. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**

2.14 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to **[four]<Insert safety factor>** times the load imposed, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hot-dip galvanized in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
- C. Embedded Plate Anchors: Fabricated from mild-steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (13-mm-)** diameter, headed studs welded to back of plate.
- D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welding.
- E. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.
- F. Grout: ASTM C476, slump not more than **4 inches (102 mm)** as measured in accordance with ASTM C143/C143M.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Exterior Sealants: Comply with Section 079200 "Joint Sealants."
- I. Weather Stripping: Unless otherwise indicated, at venting units provide weather stripping such as molded EPDM or neoprene gaskets complying with ASTM D2000, Designations 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention windows.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention window connections before detention window installation.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention windows.
- D. Inspect built-in and cast-in anchor installations, before installing detention windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- E. For factory-installed glazing materials whose orientation is critical for performance, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other detention window anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. In-Place-Construction Anchors: Install **[embedded plate anchors][3/16-inch- (4.8-mm-) thick steel angle or formed-steel plate anchors with attached 1/2-inch- (13-mm-) diameter anchor studs]** in window openings at locations corresponding to detention window-frame anchors.

3.3 INSTALLATION

- A. General: Install detention windows level, plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings, coordination drawings, and manufacturer's written instructions.
 - 1. Provide anchorage devices and fasteners as required to secure detention windows to wall construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
- B. In-Place-Construction Anchor Installation: Weld angle anchors to embedded anchors to match locations of detention window-frame anchors. Detach removable covers from detention window frames and set frames into opening until detention window-frame anchors contact and match embedded anchors. Weld detention window-frame anchors to embedded anchors with **[continuous welds][minimum 1-inch- (25-mm-) long welds with spacing not to exceed 18 inches (457 mm)]**. Reinstall removable covers.
- C. Built-in Frame Installation: Build-in or cast-in detention window frames or subframes integral with construction of walls. Fully engage detention window-frame anchors with wall reinforcement.
- D. Grout: Fill spaces between detention windows and adjacent substrate with grout. Install grout in lifts and take other precautions, including bracing detention windows, to ensure that detention windows are not deformed or damaged by grout forces.
- E. Removable Covers, Glazing Stops, and Trim: Fasten components with security fasteners.
 - 1. Install detention windows with glazing stops **[and removable covers]** located on secure (non-

inmate) side of openings.

- F. Security Fasteners: Install detention windows using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. [**Provide stainless steel security fasteners in stainless steel materials.**]
- G. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.
 - 1. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.
 - 2. Security Sealant: At inmate side, apply [**polyurethane**] [**epoxy**] security sealant between detention window frame and adjacent construction.
- H. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Glazing: Comply with installation requirements in Section 088853 "Security Glazing" unless otherwise indicated.
- J. Detention Screens: Secure screens to the interior side of window frames using security fasteners.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace detention work where inspections indicate that work does not comply with specified requirements.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification [**endorsed by Detention Specialist**] that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

- A. Adjust operating ventilators and hardware to provide a tight fit at contact points and weather stripping, for smooth operation and a weathertight enclosure.
- B. Remove and replace defective work, including detention windows [**and screens**] that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of detention windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.



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- B. Clean glass of preglazed detention windows promptly after installation. Comply with requirements in Section 088853 "Security Glazing" for cleaning and maintenance.
- C. Provide temporary protection to ensure that detention windows are without damage at time of Substantial Completion.

END OF SECTION 11 98 21 00



Task	Specification	Specification Description
11 98 21 00	11 98 12 00	Detention Enclosures
11 98 21 00	12 55 00 00	Detention Furniture



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Task	Specification	Specification Description
12 01 60 00	01 11 19 00	No Specification Required
12 01 60 00	12 61 00 00	Fixed Audience Seating



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SECTION 12 21 13 00 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal louver blinds, aluminum slats.
2. Horizontal louver blinds, wood slats.
3. Horizontal louver blinds, polymer slats.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, [**electrical characteristics**,] and furnished accessories.
3. **<Insert requirements>**.

B. Shop Drawings: For horizontal louver blinds.

1. Fabrication and installation details.
2. Diagrams for power, signal, and control wiring for motorized units.
3. **<Insert requirements>**.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of horizontal louver blind.

1. Include Samples of accessories involving color selection.

D. Samples for Verification: Actual sample of finished products for each type and color of horizontal louver blind.

1. Size: **[Manufacturers' standard size]**<Insert size>.

E. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

F. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
3. Health Product Declaration (HPD): For each product.
4. Health Product Declaration (HPD): Provide HPD.
5. Cradle to Cradle: For each product, provide documentation of Cradle to Cradle certification.
6. Cradle to Cradle: For each product, provide documentation of Cradle to Cradle certification.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701, for tests performed by **[a qualified testing agency][manufacturer and witnessed by a qualified testing agency]**.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For horizontal louver blinds.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than **[two]**<Insert number> units. Include brackets.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and

location of installation, using same designations indicated on Drawings.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of motorized products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of motorized operating system components.
 - 2. Warranty Period: **[5]<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain horizontal louver blinds from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide horizontal louver blinds that comply with WCMA A100.1[**and are listed and labeled as "Best for Kids" by a qualified testing agency**].

2.3 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Horizontal Louver Blinds, Aluminum Slats:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[CACO, Inc.]**
 - b. **[Hunter Douglas Architectural]**
 - c. **[Springs Window Fashions; SWFcontract]**
 - d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CACO, Inc.]**
 - b. **[Hunter Douglas Architectural]**
 - c. **[Springs Window Fashions; SWFcontract]**
 - d. **<Insert manufacturer's name>**

- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.

- C. Slats: Aluminum; alloy and temper recommended in writing by producer for type of use and finish indicated; with crowned profile and radius corners.
 1. Width: **[1/2 inch (13 mm)][1 inch (25 mm)][1-3/8 inches (35 mm)][2 inches (51 mm)]<Insert dimension>**.
 2. Thickness: **[Manufacturer's standard][Not less than 0.006 inch (0.15 mm)][Not less than 0.008 inch (0.20 mm)]<Insert thickness>**.
 3. Spacing: **[Manufacturer's standard]<Insert dimension>**.
 4. Finish: **[Ionized antistatic, dust-repellent, baked polyester finish][Reflective finish on outside-facing surface of slat to enhance reflection of solar energy]<Insert finish>**.
 5. Features:
 - a. Privacy Slats: Manufacturer's standard privacy slats with no inner lift-cord route holes or with minimum size inner lift-cord route holes located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
 - b. Perforated Slats: Openness factor of **[7 to 8]<Insert number(s)>** percent.
 - c. Inverted slats.
 - d. **<Insert description>**.

- D. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
 1. Type: **[Braided cord][Reinforced vinyl tape, manufacturer's standard width][Cloth tape, manufacturer's standard width]<Insert description>**.

- E. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose control mechanisms on three sides.
 1. Capacity: **[One][Two]** blind(s) per headrail unless otherwise indicated.
 2. Ends: **[Manufacturer's standard][Capped or plugged]<Insert description>**.

- F. Manual Corded Operation:
 1. Lift Mechanism:
 - a. Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within blind full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long]**.
 2. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
 3. Lift Cord: Manufacturer's standard braided cord.
 4. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed]**.

5. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
6. Tilt Position:
 - a. Full.
 - b. **[One][Two]**-direction, positive stop or lockout limited at an angle of **[20][60][80]<Insert number>** degrees from horizontal[, **both directions**].
7. Tilt Operator: **[Clear-plastic wand][Corrosion-resistant steel rod][Inaccessible dual cord]<Insert description>**.
8. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
9. Tilt-Operator Length, Wand or Rod: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
10. Tilt-Operator Length, Cord: Inaccessible dual cord, not greater than **12 inches (305 mm)** in length in all phases of operation.
11. Lift-Cord and Tilt-Operator Locations: **[Manufacturer's standard][Right side and left side of headrail, respectively,][Left side and right side of headrail, respectively,][Right side of headrail][Left side of headrail]** unless otherwise indicated.

G. Manual Cordless Operation:

1. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
2. Lift Operator: **[Plastic lip on bottom rail for manually raising/lowering blinds][Standard bottom rail, no lip][Manufacturer's standard]**.
3. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
4. Tilt Position:
 - a. Full.
 - b. **[One][Two]**-direction, positive stop or lockout limited at an angle of **[20][60][80]<Insert number>** degrees from horizontal[, **both directions**].
5. Tilt Operator: **[Clear-plastic wand][Corrosion-resistant steel rod]<Insert description>**.
6. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
7. Tilt-Operator Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
8. Tilt-Operator Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.

H. Motorized Operation: Provide factory-assembled motorized blinds with blind-operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system.

1. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FDDR; including UL 325.
3. Function: **[Lift and tilt][Tilt]**.
4. Power: **[Single phase, 120 V, 60 Hz ac][Battery, 12 V dc][Manufacturer's standard]<Insert requirements>**.
5. Motor Type: Radio frequency.
6. Operation, Radio Frequency: **[Two]<Insert number>** manufacturer's standard **[multichannel][single-channel]** remote-control handheld transmitter for operation of up to **[12]<Insert number>** individual blinds or up to **[6]<Insert number>** groups of blinds and with operating features as follows:

- a. Tilt slats open and lift blinds; tilt slats closed and lower blinds.
 - b. Tilt slats open; tilt slats closed both directions.
 - c. Tilt slats up at 45 degrees from horizontal; tilt slats down at 45 degrees from horizontal.
 - d. Tilt slats to stop at any angle.
 - e. Tilt slats to programmable preset tilt position.
 - f. Phone- or tablet-control app integration with automated timed programming capability.
 - g. Override switch.
 - h. Color: **[Manufacturer's standard][White][Black]**.
 - i. **<Insert description>**.
7. Travel Limit/Stop: Adjustable control, interlocked with motor controls and set to stop blind automatically at slats fully closed tilted down and slats fully closed tilted up.
8. Provide power disconnect switch.
9. Lift Mechanism:
 - a. Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within blind full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long]**.
10. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
11. Lift Cord: Manufacturer's standard braided cord.
12. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed]**.
13. Lift-Cord Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.
- I. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and inner lift cords and has plastic- or metal-capped ends.
 1. Type: **[Manufacturer's standard][Top contoured to match crowned shape of slat][Bottom contoured to minimize light gaps]<Insert description>**.
- J. Integrated Headrail/Valance: **[Curved face]<Insert description>**.
- K. Valance: **[Two slats][PVC strip][Manufacturer's standard]<Insert description>**.
- L. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 1. Type: **[Wall][Overhead][End][Wall extension][Two piece for pocket installation][As indicated]<Insert description>**.
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by horizontal louver blind manufacturer for weight and size of blind.
- M. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- N. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- O. Colors, Textures, Patterns, and Gloss:
 1. Slats: **[Match Architect's samples][Match Architect's samples for custom color and other characteristics][As selected by Architect from manufacturer's full range][As indicated]<Insert description>**.
 2. Components: **[Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated]<Insert description>**.

2.4 HORIZONTAL LOUVER BLINDS, WOOD SLATS

A. Horizontal Louver Blinds, Wood Slats:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[CACO, Inc.]**
 - b. **[Comfortex Window Fashions; Comfortex Corporation]**
 - c. **[Hunter Douglas Architectural]**
 - d. **[Springs Window Fashions; SWFcontract]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CACO, Inc.]**
 - b. **[Comfortex Window Fashions; Comfortex Corporation]**
 - c. **[Hunter Douglas Architectural]**
 - d. **[Springs Window Fashions; SWFcontract]**
 - e. **<Insert manufacturer's name>**

B. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.

C. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.

D. Slats: Hardwood, **[manufacturer's standard species][North American][basswood][poplar][ramin]<Insert species>**.

1. Width: **[1 inch (25 mm)][2 inches (51 mm)][2-3/8 inches (60 mm)][2-1/2 inches (64 mm)]<Insert dimension>**.
2. Thickness: **[Manufacturer's standard][0.125 inch (3.2 mm)]<Insert thickness>**.
3. Spacing: **[Manufacturer's standard]<Insert dimension>**.
4. Profile: **[Flat][Flat with beaded edges][Flat with double beaded edges]<Insert profile>**.
5. Corners: **[Square][Radius]**.
6. Features:
 - a. Privacy Slats: Manufacturer's standard privacy slats with no inner lift-cord route holes or with minimum size inner lift-cord route holes located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
 - b. **<Insert description>**.

E. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.

1. Type: **[Braided cord][Cloth tape, manufacturer's standard width]<Insert description>**.

F. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose control mechanisms on three sides and ends.

1. Capacity: **[One][Two]** blind(s) per headrail unless otherwise indicated.

G. Manual Corded Operation:

1. Lift Mechanism:
 - a. Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long].**
2. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
3. Lift Cord: Manufacturer's standard braided cord.
4. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed].**
5. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
6. Tilt Position:
 - a. Full.
 - b. **[One][Two]-direction, positive stop or lockout limited at an angle of [20][60][80]<Insert number> degrees from horizontal[, both directions].**
7. Tilt Operator: **[Clear-plastic wand][Wood wand matching slats][Corrosion-resistant steel rod][Inaccessible dual cord]<Insert description>.**
8. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
9. Tilt-Operator Length, Wand or Rod: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>.**
10. Tilt-Operator Length, Cord: Inaccessible dual cord, not greater than **12 inches (305 mm)** in length in all phases of operation.
11. Lift-Cord and Tilt-Operator Locations: **[Manufacturer's standard][Right side and left side of headrail, respectively,][Left side and right side of headrail, respectively,][Right side of headrail][Left side of headrail]** unless otherwise indicated.
12. Tassels: Hardwood finished to match slats, **[manufacturer's standard]<Insert description>.**

H. Manual Cordless Operation:

1. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
2. Lift Operator: Lift and lock button on bottom rail for manually raising/lowering blinds when pressed and held, and locking blinds into position when released.
3. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
4. Tilt Position:
 - a. Full.
 - b. **[One][Two]-direction, positive stop or lockout limited at an angle of [20][60][80]<Insert number> degrees from horizontal[, both directions].**
5. Tilt Operator: **[Clear-plastic wand][Wood wand matching slats][Corrosion-resistant steel rod]<Insert description>.**
6. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
7. Tilt-Operator Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>.**
8. Tilt-Operator Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.

- I. Motorized Operation: Provide factory-assembled motorized blinds with blind-operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system.

1. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Listing Criteria: UL CCN FDDR; including UL 325.
 3. Function: Tilt.
 4. Power: **[Battery, 12 V dc][Manufacturer's standard]<Insert requirements>**.
 5. Motor Type: Radio frequency.
 6. Operation, Radio Frequency: **[Two]<Insert number>** manufacturer's standard **[multichannel][single-channel]** remote-control handheld transmitter for operation of up to **[12]<Insert number>** individual blinds or up to **[6]<Insert number>** groups of blinds and with operating features as follows:
 - a. Tilt slats open; tilt slats closed, both directions.
 - b. Tilt slats up at 45 degrees from horizontal; tilt slats down at 45 degrees from horizontal.
 - c. Tilt slats to stop at any angle.
 - d. Tilt slats to programmable preset tilt position.
 - e. Phone- or tablet-control app integration with automated timed programming capability.
 - f. Override switch.
 - g. Color: **[Manufacturer's standard][White][Black]**.
 - h. **<Insert description>**.
 7. Travel Limit/Stop: Adjustable control, interlocked with motor controls and set to stop blind automatically at slats fully closed tilted down and slats fully closed tilted up.
 8. Provide power disconnect switch.
 9. Manual Corded Lift:
 - a. Lift Mechanism:
 - 1) Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within blind full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long]**.
 - b. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
 - c. Lift Cord: Manufacturer's standard braided cord.
 - d. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed]**.
 - e. Lift-Cord Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.
 - f. Tassels: Hardwood finished to match slats, **[manufacturer's standard]<Insert description>**.
 10. Manual Cordless Lift:
 - a. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
 - b. Lift Operator: Lift and lock button on bottom rail for manually raising/lowering blinds when pressed and held, and locking blinds into position when released.
- J. Bottom Rail: Secures and protects ends of ladders and inner lift cords.
1. Type: **[Manufacturer's standard][Hardwood, finished to match slats, with trapezoid-shaped bottom angled to minimize light gaps][Manufacturer's standard enclosing lift-and-lock**

control mechanisms on three sides]<Insert type>.

- K. Valance: **[Manufacturer's standard]<Insert description>**.
- L. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: **[Wall][Overhead][End][Wall extension][Two piece for pocket installation][As indicated]<Insert description>**.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by horizontal louver blind manufacturer for weight and size of blind.
- M. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- N. Colors, Finishes, and Gloss:
 - 1. Slats: **[Match Architect's samples][Match Architect's samples for custom color and other characteristics][As selected by Architect from manufacturer's full range][As indicated]<Insert description>**.
 - 2. Components: **[Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated]<Insert description>**.

2.5 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

- A. Horizontal Louver Blinds, Polymer Slats:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[CACO, Inc.]**
 - b. **[Comfortex Window Fashions; Comfortex Corporation]**
 - c. **[Hunter Douglas Architectural]**
 - d. **[Springs Window Fashions; SWFcontract]**
 - e. **[TimberBlindsMetroShade; Timberblinds, LLC]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CACO, Inc.]**
 - b. **[Comfortex Window Fashions; Comfortex Corporation]**
 - c. **[Hunter Douglas Architectural]**
 - d. **[Springs Window Fashions; SWFcontract]**
 - e. **[TimberBlindsMetroShade; Timberblinds, LLC]**
 - f. **<Insert manufacturer's name>**
- B. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
- C. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.

- D. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.
1. Formulation: **[Permanently flexible, extruded PVC][Foam PVC][Polymer/wood composite][Manufacturer's standard]<Insert formulation>**.
 2. Width: **[2 inches (51 mm)][2-1/2 inches (64 mm)]<Insert dimension>**.
 3. Thickness: **[0.125 inch (3.2 mm)]<Insert dimension>**.
 4. Spacing: **[Manufacturer's standard]<Insert dimension>**.
 5. Profile: **[Crowned][Manufacturer's standard]<Insert profile>**.
 6. Features:
 - a. Privacy Slats: Manufacturer's standard privacy slats with no inner lift-cord route holes or with minimum size inner lift-cord route holes located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
 - b. **<Insert description>**.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
1. Type: **[Braided cord][Cloth tape, manufacturer's standard width]<Insert description>**.
- G. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose control mechanisms on three sides and ends.
1. Capacity: **[One][Two]** blind(s) per headrail unless otherwise indicated.
- H. Manual Corded Operation:
1. Lift Mechanism:
 - a. Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long]**.
 2. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
 3. Lift Cord: Manufacturer's standard braided cord.
 4. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed]**.
 5. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 6. Tilt Position:
 - a. Full.
 - b. **[One][Two]**-direction, positive stop or lockout limited at an angle of **[20][60][80]<Insert number>** degrees from horizontal[, **both directions**].
 7. Tilt Operator: **[Clear-plastic wand][Corrosion-resistant steel rod][Inaccessible dual cord]<Insert description>**.
 8. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
 9. Tilt-Operator Length, Wand or Rod: **[24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 10. Tilt-Operator Length, Cord: Inaccessible dual cord, not greater than **12 inches (305 mm)** in length in all phases of operation.
 11. Lift-Cord and Tilt-Operator Locations: **[Manufacturer's standard][Right side and left side of**

headrail, respectively,][Left side and right side of headrail, respectively,][Right side of headrail][Left side of headrail] unless otherwise indicated.

I. Manual Cordless Operation:

1. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
2. Lift Operator: **[Manufacturer's standard][Plastic lip on bottom rail for manually raising/lowering blinds][Bottom rail, no lip][Lift-and-lock button on bottom rail for manually raising/lowering blinds when pressed and held, and locking blinds into position when released]**.
3. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
4. Tilt Position:
 - a. Full.
 - b. **[One][Two]-direction, positive stop or lockout limited at an angle of [20][60][80]<Insert number> degrees from horizontal[, both directions].**
5. Tilt Operator: **[Clear-plastic wand][Corrosion-resistant steel rod]<Insert description>.**
6. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
7. Tilt-Operator Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>.**
8. Tilt-Operator Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.

J. Motorized Operation: Provide factory-assembled motorized blinds with blind-operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system.

1. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FDDR; including UL 325.
3. Function: Tilt.
4. Power: **[Battery, 12 V dc][Manufacturer's standard]<Insert requirements>.**
5. Motor Type: Radio frequency.
6. Operation, Radio Frequency: **[Two]<Insert number> Manufacturer's standard [multichannel][single-channel] remote-control handheld transmitter for operation of up to [12]<Insert number> individual blinds or up to [6]<Insert number> groups of blinds and with operating features as follows:**
 - a. Tilt slats open; tilt slats closed both directions.
 - b. Tilt slats up at 45 degrees from horizontal; tilt slats down at 45 degrees from horizontal.
 - c. Tilt slats to stop at any angle.
 - d. Tilt slats to programmable preset tilt position.
 - e. Phone- or tablet-control app integration with automated timed programming capability.
 - f. Override switch.
 - g. Color: **[Manufacturer's standard][White][Black].**
 - h. **<Insert description>.**
7. Travel Limit/Stop: Adjustable control, interlocked with motor controls and set to stop blind automatically at slats fully closed tilted down and slats fully closed tilted up.
8. Provide power disconnect switch.
9. Manual Corded Lift:

- a. Lift Mechanism:
 - 1) Lift-Cord Lock: **[Variable; stops lift cord at user-selected position within blind full operating range][Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches (100 mm) long].**
 - b. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
 - c. Lift Cord: Manufacturer's standard braided cord.
 - d. Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when blind is fully closed][Inaccessible cord, not greater than 12 inches (305 mm) when blind is fully closed].**
 - e. Lift-Cord Location: **[Manufacturer's standard][Right side of headrail][Left side of headrail]** unless otherwise indicated.
10. Manual Cordless Lift:
- a. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
 - b. Lift Operator: Lift and lock button on bottom rail for manually raising/lowering blinds when pressed and held, and locking blinds into position when released.
- K. Bottom Rail: Secures and protects ends of ladders and inner lift cords.
1. Type: **[Manufacturer's standard][Formed-steel or extruded-aluminum tube, with plastic or metal capped ends][Hardwood matching slats and trapezoid-shaped bottom angled for minimizing light gaps][Manufacturer's standard enclosing lift-and-lock control mechanisms on three sides]<Insert type>.**
- L. Valance: **[Manufacturer's standard]<Insert description>.**
- M. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
1. Type: **[Wall][Overhead][End][Wall extension][Two piece for pocket installation][As indicated]<Insert description>.**
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by horizontal louver blind manufacturer for weight and size of blind.
- N. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- O. Colors, Textures, Patterns, and Gloss:
1. Slats: **[Match Architect's samples][Match Architect's samples for custom color and other characteristics][As selected by Architect from manufacturer's full range][As indicated]<Insert description>.**
 2. Components: **[Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated]<Insert description>.**
- 2.6 FABRICATION OF HORIZONTAL LOUVER BLINDS
- A. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less **1/4 inch (6 mm)** per side or **1/2 inch (13 mm)** total, plus or minus **1/8 inch (3.1 mm)**. Length equal to head-to-sill dimension of opening in which blind is installed less **1/4 inch (6 mm)**, plus or minus **1/8 inch (3.1 mm)**.
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- C. Mounting Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind mounting method indicated.
- D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- E. Color-Coated Finish:
1. Metal: For components exposed to view, unless anodized or plated finish is indicated, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
 2. Wood: Apply **[manufacturer's standard]<Insert description>** factory-applied finish complying with manufacturer's written instructions for surface preparation, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, **[locations of connections to building electrical system]** and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HORIZONTAL LOUVER BLINDS

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
 1. Locate so exterior slat edges are not closer than **[1 inch (25 mm)][2 inches (51 mm)]<Insert dimension>** from interior faces of glass and not closer than **[1/2 inch (13 mm)][1-1/2 inches (38 mm)]<Insert dimension>** from interior faces of glazing frames **[at top and bottom][at one side and bottom]** through full operating ranges of blinds.
 2. Install mounting brackets to prevent deflection of headrails.
 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building

components and furnishings.

- B. Electrical Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 12 21 13 00



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Task	Specification	Specification Description
12 21 13 13	12 21 13 00	Horizontal Louver Blinds
12 21 13 13	12 21 16 00	Vertical Louver Blinds
12 21 13 33	12 21 13 00	Horizontal Louver Blinds
12 21 13 33	12 21 16 00	Vertical Louver Blinds



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SECTION 12 21 16 00 - VERTICAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vertical louver blinds, aluminum vanes.
2. Vertical louver blinds, PVC vanes.
3. Vertical louver blinds, PVC vanes with fabric inserts.
4. Vertical louver blinds, fabric vanes.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting vertical louver blinds and accessories.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, and furnished accessories.
3. **<Insert requirements>.**

B. Shop Drawings: For vertical louver blinds.

1. Fabrication and installation details.
2. **<Insert requirements>.**

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of vertical louver blind.

1. Include Samples of accessories involving color selection.

D. Samples for Verification: Actual sample of finished product for each type and color of vertical louver blind.

1. Size: **[Manufacturers' standard size]<Insert size>.**

- E. Product Schedule: For vertical louver blinds. Use same designations indicated on Drawings.
- F. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 3. Health Product Declaration (HPD): For each product.
 - 4. Health Product Declaration (HPD): Provide HPD.
 - 5. Cradle to Cradle: For each product, provide documentation of Cradle to Cradle certification.
 - 6. Cradle to Cradle: For each product, provide documentation of Cradle to Cradle certification.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For vertical louver blinds with **[PVC][fabric]** vanes that have been tested for compliance with NFPA 701 for tests performed by **[a qualified testing agency][manufacturer and witnessed by a qualified testing agency]**.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For vertical louver blinds.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Vertical Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and finish indicated, but no fewer than **[two]<Insert number>** units. Include brackets.
 - 2. Vanes: Furnish quantity of full-size units equal to 5 percent of quantity installed for each type, size, texture, pattern, and finish indicated, but no fewer than **[two]<Insert number>** units.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver vertical louver blinds in factory packages, marked with manufacturer and product name, and

location of installation using same designations indicated on Drawings.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install vertical louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where vertical louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain vertical louver blinds from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide vertical louver blinds that comply with WCMA A100.1[**and are listed and labeled as "Best for Kids" by a qualified testing agency**].

2.3 VERTICAL LOUVER BLINDS, ALUMINUM VANES

- A. Vertical Louver Blinds, Aluminum Vanes:
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. **[Hunter Douglas Architectural]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hunter Douglas Architectural]**
 - b. **<Insert manufacturer's name>**
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
- C. Vanes: Aluminum, alloy, and temper recommended by producer for type of use and finish indicated; with crowned profile and not less than **3/8-inch (9.5-mm)** overlap when rotated fully closed.

1. Width: **3-1/2 inches (89 mm)**.
2. Features:
 - a. Perforated Vanes: Manufacturer's standard openness factor.
 - b. **<Insert description>**.
- D. Headrail: Channel, extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses control mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).
- E. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; remaining carriers have self-lubricating wheels.
- F. Manual Corded Operation:
 1. Traverse Operator: **[Nickel-plated, metal bead chain loop][Manufacturer's standard braided cord loop]** with WCMA A100.1-compliant tension device.
 - a. Tension Device Mounting: **[Wall][Floor][Sill][Baseboard][As indicated on Drawings]**.
 2. Rotation Operator: **[Wand][Inaccessible dual nickel-plated, metal bead chain][Automatic rotation mechanically activated by traverse control]<Insert description>**.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
 - c. Metal Bead Chain Length: Inaccessible dual bead chain, not greater than **12 inches (305 mm)** in length in all phases of operation.
 3. Control Locations: **[Right][Left][As indicated on Drawings]**.
 4. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.
- G. Manual Cordless Operation:
 1. Traverse and Rotation Operator: Single wand operates both traverse and rotation.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
 2. Control Location: **[Right][Left][As indicated on Drawings]**.
 3. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.
- H. Valance: **[Manufacturer's standard with vane insert]<Insert description>**.
- I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 1. Type: **[Wall][Overhead][For headrail recessed in pocket][As indicated]<Insert description>**.
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by vertical louver blind manufacturer for weight and size of blind.

J. Colors, Textures, and Patterns:

1. Vanes: **[Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated on Drawings]<Insert description>.**
2. Components: **[Provide materials exposed to view matching or coordinating with vanes unless otherwise indicated]<Insert description>.**

2.4 VERTICAL LOUVER BLINDS, PVC VANES

A. Vertical Louver Blinds, PVC Vanes:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Hunter Douglas Architectural]**
 - b. **[Springs Window Fashions; SWFcontract]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hunter Douglas Architectural]**
 - b. **[Springs Window Fashions; SWFcontract]**
 - c. **<Insert manufacturer's name>**

B. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.

C. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.

D. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

E. Vanes: Lead-free, UV-stabilized, integrally colored, opaque, permanently flexible, extruded PVC that will not crack or yellow; with not less than **3/8-inch (9.5-mm)** overlap when vanes are rotated fully closed.

1. Width: **[2 inches (51 mm)][3-1/2 inches (89 mm)].**
2. Profile: **[Flat][Crowned][S-shaped]<Insert profile>.**
3. Features:
 - a. Perforated Vanes: Openness factor of **[3 to 4][6 to 7][12 to 13]<Insert number(s)>** percent.
 - b. Bottom chain.
 - c. **<Insert description>.**

F. Headrail: Channel, formed steel or extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses control mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).

G. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; remaining carriers have self-lubricating wheels.

H. Manual Corded Operation:

1. Traverse Operator: **[Nickel-plated, metal bead chain loop][Manufacturer's standard braided cord loop]** with WCMA A100.1-compliant tension device.
 - a. Tension Device Mounting: **[Wall][Floor][Sill][Baseboard][As indicated on Drawings]**.
2. Rotation Operator: **[Wand][Inaccessible dual nickel-plated, metal bead chain][Automatic rotation mechanically activated by traverse control]<Insert description>**.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
 - c. Metal Bead Chain Length: Inaccessible dual bead chain, not greater than **12 inches (305 mm)** in length in all phases of operation.
3. Control Locations: **[Right][Left][As indicated on Drawings]**.
4. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.

I. Manual Cordless Operation:

1. Traverse and Rotation Operator: Single wand operates both traverse and rotation.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
2. Control Location: **[Right][Left][As indicated on Drawings]**.
3. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.

J. Valance: [Manufacturer's standard with vane insert]<Insert description>**K. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.**

1. Type: **[Wall][Overhead][For headrail recessed in pocket][As indicated]<Insert description>**.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by vertical louver blind manufacturer for weight and size of blind.

L. Colors, Textures, and Patterns:

1. Vanes: **[Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated on Drawings]<Insert description>**.
2. Components: **[Provide materials exposed to view matching or coordinating with vanes unless otherwise indicated]<Insert description>**.

2.5 VERTICAL LOUVER BLINDS, PVC VANES WITH FABRIC INSERTS**A. Vertical Louver Blinds, PVC Vanes with Fabric Inserts:**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[Hunter Douglas Architectural]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hunter Douglas Architectural]**
 - b. **<Insert manufacturer's name>**
- B. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
- C. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.
- D. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Vanes: Lead-free, UV-stabilized, integrally colored, opaque, permanently flexible, extruded PVC that will not crack or yellow; with clear grooves for holding fabric insert and with not less than **3/8-inch (9.5-mm)** overlap when vanes are rotated fully closed.
 1. Width: **3-1/2 inches (89 mm)**.
 2. Fabric Insert: **[Manufacturer's standard]<Insert fabric description>**; stain and fade resistant.
- F. Headrail: Channel, formed steel or extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses control mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).
- G. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; remaining carriers have self-lubricating wheels.
- H. Manual Corded Operation:
 1. Traverse Operator: **[Nickel-plated, metal bead chain loop][Manufacturer's standard braided cord loop]** with WCMA A100.1-compliant tension device.
 - a. Tension Device Mounting: **[Wall][Floor][Sill][Baseboard][As indicated on Drawings]**.
 2. Rotation Operator: **[Wand][Inaccessible dual nickel-plated, metal bead chain][Automatic rotation mechanically activated by traverse control]<Insert description>**.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
 - c. Metal Bead Chain Length: Inaccessible dual bead chain, not greater than **12 inches (305 mm)** in length in all phases of operation.
 3. Control Locations: **[Right][Left][As indicated on Drawings]**.
 4. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.

- I. Manual Cordless Operation:
 - 1. Traverse and Rotation Operator: Single wand operates both traverse and rotation.
 - a. Wand Length: [12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>.
 - b. Wand Finish: [White][Off white][Satin nickel][Bronze]<Insert finish>.
 - 2. Control Location: [Right][Left][As indicated on Drawings].
 - 3. Draw and Stack: [One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings].
- J. Valance: [Manufacturer's standard with vane insert]<Insert description>.
- K. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: [Wall][Overhead][For headrail recessed in pocket][As indicated]<Insert description>.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by vertical louver blind manufacturer for weight and size of blind.
- L. Colors, Textures, and Patterns:
 - 1. Vanes:
 - a. PVC: [Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated on Drawings]<Insert description>.
 - b. Fabric Inserts: [Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated on Drawings]<Insert description>.
 - 2. Components: [Provide materials exposed to view matching or coordinating with PVC vanes unless otherwise indicated]<Insert description>.

2.6 VERTICAL LOUVER BLINDS, FABRIC VANES

- A. Vertical Louver Blinds, Fabric Vanes:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Hunter Douglas Architectural]
 - b. [Springs Window Fashions; SWFcontract]
 - c. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Hunter Douglas Architectural]
 - b. [Springs Window Fashions; SWFcontract]
 - c. <Insert manufacturer's name>

- B. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
- C. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.
- D. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Vanes: **[Manufacturer's standard]<Insert fabric description>** free-hanging fabric with hemmed, nonraveling edges; stain and fade resistant; with not less than **3/8-inch (9.5-mm)** overlap when vanes are rotated fully closed.
 - 1. Width: **3-1/2 inches (89 mm)**.
 - 2. Features:
 - a. Weight, sewn in at bottom of vanes.
 - b. Bottom chain.
 - c. **<Insert description>**.
- F. Headrail: Channel, formed steel or extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses control mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).
- G. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; remaining carriers have self-lubricating wheels.
- H. Manual Corded Operation:
 - 1. Manual Traverse Control: **[Nickel-plated, metal bead chain loop][Manufacturer's standard braided cord loop]** with WCMA A100.1-compliant tension device.
 - a. Tension Device Mounting: **[Wall][Floor][Sill][Baseboard][As indicated on Drawings]**.
 - 2. Rotation Operator: **[Wand][Inaccessible dual nickel-plated, metal bead chain][Automatic rotation mechanically activated by traverse control]<Insert description>**.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert finish>**.
 - c. Metal Bead Chain Length: Inaccessible dual bead chain, not greater than **12 inches (305 mm)** in length in all phases of operation.
 - 3. Control Locations: **[Right][Left][As indicated on Drawings]**.
 - 4. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.
- I. Manual Cordless Operation:
 - 1. Traverse and Rotation Operator: Single wand operates both traverse and rotation.
 - a. Wand Length: **[12 inches (305 mm)][24 inches (610 mm)][30 inches (762 mm)][36 inches (914 mm)][48 inches (1219 mm)]<Insert length>**.
 - b. Wand Finish: **[White][Off white][Satin nickel][Bronze]<Insert description>**.

2. Control Location: **[Right][Left][As indicated on Drawings]**.
3. Draw and Stack: **[One way, stack left][One way, stack right][Two way, center split][Two way, center stack][As indicated on Drawings]**.

J. Valance: **[Manufacturer's standard with vane insert]<Insert description>**.

K. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

1. Type: **[Wall][Overhead][For headrail recessed in pocket][As indicated]<Insert description>**.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by vertical louver blind manufacturer for weight and size of blind.

L. Colors, Textures, and Patterns:

1. Vanes: **[Match Architect's samples][As selected by Architect from manufacturer's full range][As indicated on Drawings]<Insert description>**.
2. Components: **[Provide materials exposed to view matching or coordinating with vanes unless otherwise indicated]<Insert description>**.

2.7 FABRICATION OF VERTICAL LOUVER BLINDS

A. Unit Sizes: Fabricate units in sizes to cover window and other openings as follows, measured at **74 deg F (23 deg C)**:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less **1/4 inch (6 mm)** per side or **1/2 inch (13 mm)** total, plus or minus **1/8 inch (3.1 mm)**. Length equal to head-to-sill or -floor dimension of opening in which blind is installed less **1/4 inch (6 mm)**, plus or minus **1/8 inch (3.1 mm)**.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Rotation-and-Traverse Mechanisms: With permanently lubricated moving parts.

C. Mounting Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind mounting method indicated.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

E. Color-Coated Finish: For metal components exposed to view unless anodized or plated finish is indicated. Apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, **[locations of connections to building electrical system,]** and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF VERTICAL LOUVER BLINDS

- A. Install vertical louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
 - 1. Locate so exterior vane edges are not closer than **[2 inches (51 mm)]<Insert dimension>** from interior faces of glass and not closer than **[1-1/2 inches (38 mm)]<Insert dimension>** from interior faces of glazing frames **[at top and bottom][at one side and bottom]** through full operating ranges of blinds.
 - 2. Install mounting brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust vertical louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean vertical louver blind surfaces after installation in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that vertical louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged vertical louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 12 21 16 00



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Task	Specification	Specification Description
12 21 16 13	12 21 13 00	Horizontal Louver Blinds
12 21 16 13	12 21 16 00	Vertical Louver Blinds
12 21 16 33	12 21 13 00	Horizontal Louver Blinds
12 21 16 33	12 21 16 00	Vertical Louver Blinds



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SECTION 12 22 00 00 - CURTAINS AND DRAPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Drapery tracks.
2. Drapes.

B. Related Requirements:

1. Section 057500 "Decorative Formed Metal" for drapery pockets.
2. Section 061000 "Rough Carpentry" for wood blocking to support drapery tracks.
3. Section 260010 "Supplemental Requirements for Electrical" for additional requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include fiber content[**and textile treatments**] for fabrics.
2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
3. Include rated capacities, operating characteristics,[**electrical characteristics**,] features, and furnished accessories
4. **<Insert requirements>**.

B. Shop Drawings:

1. Drapery Tracks: Indicate installation and anchorage details and locations of controls.
 - a. Motorized Tracks: Indicate dimensions, weights, and required clearances for track and motor and differentiate between manufacturer-installed and field-installed wiring.
2. Drapes: Show sizes, locations, and details of installation.
3. **<Insert requirements>**.

C. Samples for Initial Selection: Manufacturer's standard color samples, showing full range of available colors for each type of drape and drapery track.

D. Samples for Verification: Actual sample of finished products for each type of drape and drapery track. Include drapery fabric from dye lot to be used for the Work with specified texture treatments applied. Include textile trims.

1. Size: **[Manufacturers' standard size]<Insert size>**.

E. Product Schedule: For **[drapes][and][drapery tracks]**. Use same designations indicated on Drawings.

F. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For product, indicating compliance with requirements for low-emitting materials.
3. Product Data: For product, indicating compliance with requirements for formaldehyde emissions.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For drapery track installation; reflected ceiling plans drawn to scale and coordinating track installation with openings and ceiling-mounted items. Indicate the following items:

1. Suspended ceiling components.
2. Motor locations for motorized tracks and supports for motors.
3. Size and location of access panels for above-ceiling motors.

B. Product Certificates: For each drapery fabric treated with flame retardant, signed by fabric supplier and indicating treatment durability and cleaning procedures required to maintain treatment effectiveness.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drapes and drapery tracks.

B. Warranty Documentation: Manufacturers' special warranties.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Drapery-Track Carriers: For each size indicated, equal to **[5]<Insert number>** percent of quantity installed, but no fewer than **[10]<Insert number>** units of each size.
2. Drapery-Track Controls: For each type indicated, equal to **[5]<Insert number>** percent of quantity installed, but no fewer than **[10]<Insert number>** units of each type.
3. Drape Fabrics: For each fabric, color, and pattern indicated, from the same product run, full-width lengths equal to **[5]<Insert number>** percent of quantity installed, but no fewer than **[10]<Insert number>** yards of each fabric, color, and pattern.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: For drapes and drapery tracks, fabricator of drapes.

1.8 MOCKUPS

- A. Install **[one]<Insert number>** of each type of drape and drapery track as a mockup to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before drape fabrication, and indicate measurements on Shop Drawings.
- B. Scheduling: Do not deliver or install drapes until after other finish work, including painting, is complete and spaces are otherwise ready for occupancy.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Defects in materials and workmanship excluding normal wear and tear.
 - b. Faulty operation of drapery track components.
 - 2. Warranty Period:
 - a. Drape Fabric: **[3]<Insert number>** years from date of Substantial Completion.
 - b. Manually Operated Track: **[Non-transferrable limited lifetime]<Insert requirements>**.
 - c. Motorized Track: **[5][8]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DRAPERY TRACKS

- A. Manually Operated Track :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Forest Drapery Hardware]**
 - b. **[Kirsch]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Forest Drapery Hardware]**
 - b. **[Kirsch]**
 - c. **<Insert manufacturer's name>**
3. Source Limitations: Obtain manually operated tracks from single source from single manufacturer.
 4. Safety Standard: WCMA A100.1.
 5. Construction: Extruded aluminum, slotted for mounting at interval of not more than **24 inches (610 mm)** o.c.
 - a. Length and Configuration: **[As indicated on Drawings]<Insert requirements>**.
 - b. Support Capability: **[Weight of drape specified][30 lb (14 kg)][45 lb (20 kg)][60 lb (27 kg)][80 lb (36 kg)][140 lb (64 kg)][210 lb (95 kg)]<Insert weight>** mounted on track length indicated.
 - c. Finish: **[Manufacturer's standard][White baked enamel][Clear anodic coating]<Insert requirements>**.
 6. Cordless Operation: **[Baton attached to lead carrier]<Insert requirements>**.
 - a. Draw: **[As indicated on Drawings][One way, stack as indicated on Drawings][One way, stack left][One way, stack right][Two way, center opening]**.
 7. Cord Operation: Continuous-loop cord with WCMA A100.1-compliant tension device installed on by track manufacturer. Provide with permanently attached tension-device warning tag.
 - a. Tension Device: Cord-tension pulley mounted on **[wall][baseboard][floor]<Insert requirements>**.
 - b. Draw: **[As indicated on Drawings][One way, stack as indicated on Drawings][One way, stack left][One way, stack right][Two way, center opening]**.
 - c. Operating Hardware Location: **[As indicated on Drawings][On stack side][Left][Right]**.
 8. Carriers: **[Coordinate with drapery headings specified]<Insert requirements>**.
 - a. Master Carriers: **[Butt][Overlap]**.
 9. End Stops: Manufacturer's standard **[with track end cap]**.
 10. Pulleys: **[Standard][Heavy]** duty.
 11. Accessories: **<Insert requirements>**.
 12. Mounting Brackets: Aluminum, of type suitable for fastening track to mounting surface and designed to support weight of track assembly and drape plus force applied to operate track.
 - a. Mounting Surface: **[As indicated on Drawings][Wall][Ceiling][Drapery pocket]<Insert description>**.
 - b. Size: **[Adjustable]<Insert requirements>**.
 13. Installation Fasteners: Sized to support track assembly and drape, and fabricated from metal compatible with track components and supporting construction.

B. Motorized Track :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [BTX Intelligent Fashion, LLC]
 - b. [Forest Drapery Hardware]
 - c. [Kirsch]
 - d. [Lutron Electronics Co., Inc]
 - e. [SKYCO]
 - f. [Somfy Systems Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [BTX Intelligent Fashion, LLC]
 - b. [Forest Drapery Hardware]
 - c. [Kirsch]
 - d. [Lutron Electronics Co., Inc]
 - e. [SKYCO]
 - f. [Somfy Systems Inc.]
 - g. <Insert manufacturer's name>
3. Source Limitations: Obtain motorized tracks from single source from single manufacturer.
4. Safety Standard: WCMA A100.1.
5. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- a. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - 1) Drapery Operators: UL CCN FDDR, including UL 325.
6. Construction: Extruded aluminum, slotted for mounting at interval of not more than **24 inches (610 mm)** o.c.
- a. Length and Configuration: [As indicated on Drawings]<Insert requirements>.
 - b. Support Capability: [Weight of drape specified][30 lb (14 kg)][45 lb (20 kg)][60 lb (27 kg)][80 lb (36 kg)][140 lb (64 kg)][210 lb (95 kg)]<Insert weight> mounted on track length indicated.
 - c. Finish: [Manufacturer's standard][White baked enamel][Clear anodic coating]<Insert requirements>.
7. Motorized Operation: Provide factory-assembled motorized drapery track with operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system.
- a. Motor Type: Replaceable motor with thermal-overload switch; sized for weight of drape and track length; and equipped with mechanism to prevent overdrawing and automatic clutch that allows drapes to be pulled by hand.
 - b. Power: [Hard wired as indicated on Drawings][Lithium battery][Rechargeable battery][Manufacturer's standard]<Insert requirements>.
 - c. Maximum Operating-Noise Level: [35 db][50 db][54 db]<Insert requirements>.
 - d. Travel Speed: [6 inches (152 mm)][8 inches (203 mm)][12 inches (305 mm)]<Insert

- dimension> per second.
- e. Draw: **[As indicated on Drawings][One-way stack as indicated on Drawings][Center split stack][Offset split stack as indicated on Drawings][Multi-stack as indicated on Drawings]<Insert requirements>**.
- f. Control Device: **[Wall switch][15-channel wireless remote][App-based control by mobile device]<Insert requirements>**.
- g. Touch-Motion Function: Gentle pull on drape activates motor without using control device.
- 8. Carriers: **[Coordinate with drapery headings specified]<Insert requirements>**.
 - a. Master Carriers: **[Butt][Overlap]**.
- 9. End Stops: Manufacturer's standard **[with track end cap]**.
- 10. Mounting Brackets: Suitable for fastening track to mounting surface and designed to support weight of track assembly and drape plus force applied to operate track.
 - a. Mounting Surface: **[As indicated on Drawings][Wall][Ceiling][Drapery pocket]<Insert requirements>**.
- 11. Installation Fasteners: Sized to support track assembly and drape, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.
- 12. Accessories: **<Insert requirements>**.

2.2 DRAPES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Barjan Manufacturing Ltd.]**
 - 2. **[County Draperies, Inc.]**
 - 3. **[Design District Drapes]**
 - 4. **[DFB Sales, Inc.]**
 - 5. **[Eagle Contract Resources]**
 - 6. **[Fabricut, Inc.]**
 - 7. **[Fabtex]**
 - 8. **[Quiltcraft Industries, Inc.]**
 - 9. **[Standard Textile Co., Inc.]**
 - 10. **[Wesco Fabrics; RM COCO Decor Ltd.]**
 - 11. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Barjan Manufacturing Ltd.]**
 - 2. **[County Draperies, Inc.]**
 - 3. **[Design District Drapes]**
 - 4. **[DFB Sales, Inc.]**
 - 5. **[Eagle Contract Resources]**
 - 6. **[Fabricut, Inc.]**
 - 7. **[Fabtex]**
 - 8. **[Quiltcraft Industries, Inc.]**
 - 9. **[Standard Textile Co., Inc.]**

10. [Wesco Fabrics; RM COCO Decor Ltd.]
 11. <Insert manufacturer's name>
- C. Source Limitations: Obtain each color and pattern of drapery fabric and trim from one dye lot.
- D. Fire-Test-Response Characteristics: Provide drapes that pass NFPA 701 as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Permanently attach label to each fabric of drape assembly indicating whether it is inherently and permanently flame resistant or is treated with a flame retardant and whether it requires retreatment after cleaning or after a designated period of use.
- E. Drape:
1. Heading:
 - a. Pinch Pleats: [200][250][300]<Insert number> percent fullness
 - 1) Folds (Fingers) per Pleat: [Two][Three][Four][Five]<Insert number>.
 - b. Stack Pleats: [60][80][100][120] percent fullness.
 - c. Roll Pleats: [60][80][100][120] percent fullness.
 - d. Accordion Pleats: [40][80][100][120] percent fullness.
 - e. <Insert requirements>.
 - f. Pleat Spacing: <Insert requirements>.
 - g. Heading Accessories:
 - 1) Nonwoven buckram.
 - 2) Woven snap tape, [7/8 inch (22 mm) wide, with nickel-plated snaps at 4 inches (102 mm) o.c.]<Insert requirements.>
 - 3) Hooks.
 - 4) <Insert requirements>.
 2. Drapery Fabric:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Applied Textiles]
 - 2) [Arc-Com Fabrics, Inc.]
 - 3) [Architex International, Inc.]
 - 4) [Carnegie Fabrics, LLC.]
 - 5) [Designtex; Design Tex Group Inc. (The)]
 - 6) [Maharam Fabric Corporation; Herman Miller, Inc.]
 - 7) [Robert Allen Design Group Holding, LLC]
 - 8) [Standard Textile Co., Inc.]
 - 9) [Wesco Fabrics; RM COCO Decor Ltd.]
 - 10) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Applied Textiles]

- 2) [Arc-Com Fabrics, Inc.]
 - 3) [Architex International, Inc.]
 - 4) [Carnegie Fabrics, LLC.]
 - 5) [Designtex; Design Tex Group Inc. (The)]
 - 6) [Maharam Fabric Corporation; Herman Miller, Inc.]
 - 7) [Robert Allen Design Group Holding, LLC]
 - 8) [Standard Textile Co., Inc.]
 - 9) [Wesco Fabrics; RM COCO Decor Ltd.]
 - 10) <Insert manufacturer's name>
- c. Fiber Content: <Insert description>.
- d. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- e. Orientation: Run right (up the bolt).
- f. Width: <Insert dimension>.
- g. Pattern-Repeat Distance: <Insert distance> vertically; <Insert distance> horizontally.
- h. Textile Treatments: [Stain repellent][Flame retardant, polymer type][Stain repellent; and flame retardant, polymer type]<Insert requirements>.
- i. Lining Fabric: [Selected by fabricator]<Insert requirements>.
- 1) Lining Type: [Blackout][Thermal reflective][Water resistant]<Insert description>.
 - 2) Color: <Insert requirements>.
 - 3) Fiber Content: <Insert requirements>.
 - 4) Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
 - 5) Width: <Insert dimension>.
 - 6) Textile Treatments: [Stain repellent][Flame retardant, polymer type][Stain repellent; and flame retardant, polymer type]<Insert requirements>.
- j. Interlining: [Selected by fabricator]<Insert requirements>.
- 1) Interlining Type: [Acoustical, minimum 0.55 NRC in accordance with ASTM C423][Blackout][Thermal]<Insert requirements>.
- k. Textile Trim: <Insert requirements>.
- l. Tiebacks: <Insert requirements>.
- m. Hem Weights: [Lead][Lead-free metal].
- 1) Type: [Square or rectangular, individual weights][Tape type (string weights)]<Insert requirements>.

2.3 FABRICATION OF DRAPES

- A. Fabricate drapes in heading styles and fullnesses indicated. Fabricate headings to stand erect. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.
1. One-Way-Stacking Drapes: Add **5 inches (127 mm)** to overall width for returns.
 2. Center-Opening Drapes: Add **10 inches (254 mm)** to overall width for overlap.
- B. Seams: Sew vertical seams with twin-needle sewing machine with selvage trimmed and overlocked. Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are unacceptable.

- C. Side Hems: Double-turned, **1-1/2-inch- (38-mm-)** wide hems consisting of three layers of fabric, and blindstitched so that stitches are invisible on face of drape.
- D. Bottom Hems: Double-turned, **4-inch- (102-mm-)** wide hems consisting of three layers of fabric, and weighted and blindstitched so that weights and stitches are invisible on face of drape.
 - 1. Sew in square lead weights at each seam and at panel corners.
- E. Interlinings: Extend from top of drape to within **1/2 inch (13 mm)** of lining's bottom hem and to leading edge of side hems to produce full-shadowed appearance.
- F. Linings: Equal to widths of drapery fabric and joined to drapery fabric at top by inside invisible seam, and hand stitched at side hems and shadowed with **1-1/2-inch (38-mm)** return of face fabric.
 - 1. Bottom Hem: **[Hem separately from][Blindstitch to]** drapery fabric.

PART 3 - EXECUTION

3.1 INSTALLATION OF DRAPERY TRACK

- A. Install track systems in accordance with manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.
- B. Isolate metal parts of tracks and brackets from concrete, masonry, and mortar to prevent galvanic action. Use tape or another method recommended in writing by track manufacturer.
- C. Locate so exterior drape edges will not be closer than **[2 inches (51 mm)]<Insert dimension>** from interior faces of glass and not closer than **[1-1/2 inches (38 mm)]<Insert dimension>** from interior faces of surrounding construction through full operating range of track.
- D. Electrical Connections: Connect hard-wired motorized operators to building electrical system.

3.2 INSTALLATION OF DRAPES

- A. Where drapes abut overhead construction, hang drapes so that clearance between headings and overhead construction is **1/4 inch (6.4 mm)**.
- B. Where drapes extend to floor, install so that bottom hems clear finished floor by not more than **1 inch (25 mm)** and not less than **1/2 inch (13 mm)**.
- C. Where drapes extend to windowsill, install so that bottom hems hang above sill line and clear sill line by not more than **1/2 inch (13 mm)**.

3.3 ADJUSTING

- A. After installing drapes, test and adjust each drapery track to produce unencumbered, smooth operation.
- B. Steam and dress down drapes as required to produce crease- and wrinkle-free installation.
- C. Remove and replace drapes that are stained or soiled.



12 - Furnishings

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized operators for drapery tracks.

END OF SECTION 12 22 00 00



Task	Specification	Specification Description
12 22 13 00	12 22 00 00	Curtains and Drapes
12 22 16 00	12 22 00 00	Curtains and Drapes
12 23 13 00	12 21 13 00	Horizontal Louver Blinds
12 23 13 00	12 21 16 00	Vertical Louver Blinds



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SECTION 12 24 13 00 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, single-roller shades.
2. Manually operated, double-roller shades.
3. Motor-operated, single-roller shades.
4. Motor-operated, double-roller shades.
5. Motor-operated, skylight roller shades.

B. Related Requirements:

1. Section 057500 "Decorative Formed Metal" for shade pockets not provided by roller window shade manufacturer.
2. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
3. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
4. Section 260010 "Supplemental Requirements for Electrical" for additional requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - b. Include rated capacities, operating characteristics, [**electrical characteristics**,] features, and furnished accessories.
 - c. **<Insert requirements>**.

B. Shop Drawings:



1. Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 2. Motor-Operated Shades: Include diagrams for power, signal, and control wiring.
 3. **<Insert requirements>**.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of shadeband material and for each type of exposed finish.
1. Include Samples of accessories involving color selection.
- D. Samples for Verification: Actual sample of finished products for each type of roller shade including actual shadeband material and installation accessories.
1. Size: **[Manufacturers' standard size]** **<Insert size>**.
- E. Product Schedule: For roller shades. **[Use same designations indicated on Drawings.]**
- F. Sustainable Design Submittals:
1. <Double click to insert sustainable design text for recycled content.>
 2. <Double click to insert sustainable design text for formaldehyde emissions>

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of shadeband material.
- B. Product Test Reports: For each type of shadeband material, for tests performed by **[a qualified testing agency]** **[manufacturer and witnessed by a qualified testing agency]**.
- C. Qualification Statements: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, **from the same production run,** to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Roller Shades: Full-size units equal to **[3]** **[5]** **<Insert number>** percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than **[two]** **<Insert number>** units. Include mounting accessories.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.9 MOCKUPS

- A. Install **[one]** **<Insert number>** of each type of roller window shade as a mockup to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Defects in materials and workmanship beyond normal wear and tear.
 - b. Faulty operation of operating system components.
 - c. Deterioration of fabric beyond normal use.
 - d. **<Insert conditions relating to specified products>**.
 - 2. Warranty Period:
 - a. Roller Window Shades: **[Five]** **[10]** **[25]** **<Insert number>** year(s) from date of Substantial Completion.
 - b. Motorized Components: **[Five]** **<Insert number>** year(s) from date of Substantial Completion.
 - c. Fabric: **[Five]** **[10]** **[25]** **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain roller shades from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide roller window shades that comply with WCMA A100.1[**and are listed and labeled as "Best for Kids" by a qualified testing agency**].
- B. Fire Performance: Tested in accordance with and meeting the flame propagation performance criteria of Test 1 or Test 2, as appropriate, of NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Drapery Operators: UL CCN FDDR, including UL 325.
- D. Accessibility Standards: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [and] [ICC A117.1] <Insert accessibility regulation> for roller window shades designated as accessible.
- E. <Double click to insert sustainable design text for formaldehyde emissions>

2.3 MANUALLY OPERATED ROLLER WINDOW SHADES

- A. Manually Operated, Single-Roller Shades <Insert drawing designation>: For interior use in rectangular openings.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - a. Roller Drive-End Location: [Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>.
 - b. Direction of Shadeband Roll: [Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller].
 - c. Shadeband-to-Roller Attachment: [Manufacturer's standard method] [Adhesive strip] [Removable spline fitting into integral channel in tube] <Insert description>.
 - 3. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers into a multiband shade that is operated by one roller drive-end assembly.

4. Shadebands:
 - a. Shadeband Material: **[Light-filtering fabric] [Light-blocking fabric] [Acoustical fabric]** **<Insert requirements>**.
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: **[Elliptical slat enclosed in sealed pocket of shadeband material] [Elliptical slat with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] [Manufacturer's standard exposed bottom bar with integral light seal] <Insert description>**.
 - 2) Color and Finish: **[As selected by Architect from manufacturer's full range] <Insert color and finish>**.
5. Mounting Hardware: Brackets or endcaps, with endcap covers where exposed, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and installation location and conditions indicated.
6. Installation Accessories:
 - a. Front Fascia: Aluminum extrusion that conceals front and underside of roller and shadeband assembly and attaches to roller endcaps without exposed fasteners.
 - 1) Shape: **[L-shaped] [Curved] <Insert requirements>**.
 - 2) Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than **[4 inches (102 mm)] [3 inches (76 mm)] <Insert dimension>**.
 - b. Exposed Headbox: Extruded-aluminum enclosure including front fascia, L-shaped top/back cover, and removable bottom closure, that fully conceals roller and shadeband assembly, and attaches to roller endcaps without exposed fasteners.
 - 1) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than **[4 inches (102 mm)] [3 inches (76 mm)] [height indicated on Drawings] <Insert dimension>**.
 - c. Recessed Shade Pocket:
 - 1) U-shaped, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, and with removable bottom closure panel and end caps or plates. **[Provide pocket with lip at lower edge to support acoustical ceiling panel.]**
 - a) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than **[6 inches (152 mm)] [5 inches (127 mm)] [4 inches (102 mm)] [height indicated on Drawings] <Insert dimension>**.
 - 2) As specified in Section 057500 "Decorative Formed Metal."
 - d. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - 1) Closure-Panel Width: **[As indicated on Drawings] [2 inches (51 mm)] <Insert dimension>**.

- e. Side Channels: Extruded aluminum "U" channel with light seals, designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
- f. Bottom (Sill) Channel or Angle: Extruded aluminum "U" channel or "L" angle with light seals, designed to eliminate light gaps at bottoms of shades when shades are closed.
- g. Installation Accessories Color and Finish: **[As selected from manufacturer's full range] <Insert color and finish>.**

B. Manually Operated, Double-Roller Shades **<Insert drawing designation>**: For interior use in rectangular openings.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - a. Double-Roller Mounting Configuration: **[Side by side] [Offset, outside roller over and inside roller under] <Insert requirements>.**
 - b. Inside Roller:
 - 1) Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>.**
 - 2) Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller].**
 - c. Outside Roller:
 - 1) Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>.**
 - 2) Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller].**
 - d. Shadeband-to-Roller Attachment: **[Manufacturer's standard method] [Adhesive strip] [Removable spline fitting into integral channel in tube] <Insert description>.**
3. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers into a multiband shade that is operated by one roller drive-end assembly.
4. Inside Shadebands:
 - a. Shadeband Material: **[Light-filtering fabric] [Acoustical fabric] <Insert requirements>.**
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: **[Elliptical slat enclosed in sealed pocket of shadeband material] [Elliptical slat with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] <Insert description>.**
 - 2) Color and Finish: **[As selected by Architect from manufacturer's full range] <Insert color and finish>.**
5. Outside Shadebands:
 - a. Shadeband Material: **[Light-blocking fabric] <Insert requirements>.**
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

- 1) Type: [Elliptical slot enclosed in sealed pocket of shadeband material] [Elliptical slot with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] [Manufacturer's standard exposed bottom bar with integral light seal] <Insert description>.
 - 2) Color and Finish: [As selected by Architect from manufacturer's full range] <Insert color and finish>.
6. Mounting Hardware: Double roller brackets or endcaps, with endcap covers where exposed, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation location and conditions indicated.
7. Installation Accessories:
- a. Double Roller Front Fascia: Aluminum extrusion that conceals front and underside of rollers and shadeband assemblies and attaches to double roller endcaps without exposed fasteners.
 - 1) Shape: [L-shaped] [Curved] <Insert requirements>.
 - 2) Height: [Manufacturer's standard height required to conceal rollers and shadeband assemblies when shades are fully open] <Insert dimension>.
 - b. Double Roller Exposed Headbox: Extruded-aluminum enclosure including front fascia, L-shaped top/back cover, and removable bottom closure, that fully conceals rollers and shadeband assemblies, and attaches to double roller endcaps without exposed fasteners.
 - 1) Size: [Manufacturer's standard height and width required to enclose rollers and shadeband assemblies when shades are fully open] [Size indicated on Drawings] <Insert dimensions>.
 - c. Double Roller Recessed Shade Pocket:
 - 1) U-shaped, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, and with removable bottom closure panel and endcaps or plates. [Provide pocket with lip at lower edge to support acoustical ceiling panel.]
 - a) Size: [Manufacturer's standard height and width required to enclose rollers and shadeband assemblies when shades are fully open] [Size indicated on Drawings] <Insert dimensions>.
 - 2) As specified in Section 057500 "Decorative Formed Metal."
 - d. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - 1) Closure-Panel Width: [As indicated on Drawings] <Insert dimension>.
 - e. Side Channels: Extruded aluminum "U" channel or "L" angle with light seals designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 - f. Bottom (Sill) Channel or Angle: Extruded aluminum "U" channel or "L" angle with light seals designed to eliminate light gaps at bottoms of shades when shades are closed.
 - g. Installation Accessories Color and Finish: [As selected from manufacturer's full range] <Insert color and finish>.

2.4 MOTOR-OPERATED ROLLER WINDOW SHADES

- A. Motor-Operated, Single-Roller Shades **<Insert drawing designation>**: For interior use in rectangular openings.
1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - a. Roller Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>**.
 - b. Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller]**.
 - c. Shadeband-to-Roller Attachment: **[Manufacturer's standard method] [Adhesive strip] [Removable spline fitting into integral channel in tube] <Insert description>**.
 3. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers into a multiband shade that is operated by one roller drive-end assembly.
 4. Shadebands:
 - a. Shadeband Material: **[Light-filtering fabric] [Light-blocking fabric] [Acoustical fabric] <Insert requirements>**.
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: **[Elliptical slat enclosed in sealed pocket of shadeband material] [Elliptical slat with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] [Manufacturer's standard exposed bottom bar with integral light seal] <Insert description>**.
 - 2) Color and Finish: **[As selected by Architect from manufacturer's full range] <Insert color and finish>**.
 5. Mounting Hardware: Brackets or endcaps, with endcap covers where exposed, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and installation location and conditions indicated.
 6. Installation Accessories:
 - a. Front Fascia: Aluminum extrusion that conceals front and underside of roller and shadeband assembly and attaches to roller endcaps without exposed fasteners.
 - 1) Shape: **[L-shaped] [Curved] <Insert requirements>**.
 - 2) Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than **[4 inches (102 mm)] [3 inches (76 mm)] <Insert dimension>**.
 - b. Exposed Headbox: Extruded-aluminum enclosure including front fascia, L-shaped top/back cover, and removable bottom closure, that fully conceals roller and shadeband assembly, and attaches to roller endcaps without exposed fasteners.
 - 1) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than **[4 inches (102 mm)] [3 inches (76 mm)] [height indicated on Drawings] <Insert dimension>**.

- c. Recessed Shade Pocket:
 - 1) U-shaped, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, and with removable bottom closure panel and end caps or plates. **[Provide pocket with lip at lower edge to support acoustical ceiling panel.]**
 - a) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than **[6 inches (152 mm)] [5 inches (127 mm)] [4 inches (102 mm)] [height indicated on Drawings] <Insert dimension>**.
 - 2) As specified in Section 057500 "Decorative Formed Metal."
- d. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - 1) Closure-Panel Width: **[As indicated on Drawings] [2 inches (51 mm)] <Insert dimension>**.
- e. Side Channels: Extruded aluminum "U" channel with light seals, designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
- f. Bottom (Sill) Channel or Angle: Extruded aluminum "U" channel or "L" angle with light seals, designed to eliminate light gaps at bottoms of shades when shades are closed.
- g. Installation Accessories Color and Finish: **[As selected from manufacturer's full range] <Insert color and finish>**.

B. Motor-Operated, Double-Roller Shades **<Insert drawing designation>**: For interior use in rectangular openings.

- 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- 2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - a. Double-Roller Mounting Configuration: **[Side by side] [Offset, outside roller over and inside roller under] <Insert requirements>**.
 - b. Inside Roller:
 - 1) Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>**.
 - 2) Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller]**.
 - c. Outside Roller:
 - 1) Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>**.
 - 2) Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller]**.
 - d. Shadeband-to-Roller Attachment: **[Manufacturer's standard method] [Adhesive strip] [Removable spline fitting into integral channel in tube] <Insert description>**.

3. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers into a multiband shade that is operated by one roller drive-end assembly.
4. Inside Shadebands:
 - a. Shadeband Material: **[Light-filtering fabric] [Acoustical fabric] <Insert requirements>.**
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: **[Elliptical slat enclosed in sealed pocket of shadeband material] [Elliptical slat with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] <Insert description>.**
 - 2) Color and Finish: **[As selected by Architect from manufacturer's full range] <Insert color and finish>.**
5. Outside Shadebands:
 - a. Shadeband Material: **[Light-blocking fabric] <Insert requirements>.**
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: **[Elliptical slat enclosed in sealed pocket of shadeband material] [Elliptical slat with endcaps, enclosed in open pocket of shadeband material] [Exposed flat bar with endcaps] [Exposed round bar with endcaps] [Exposed tube with endcaps] [Manufacturer's standard exposed bottom bar with integral light seal] <Insert description>.**
 - 2) Color and Finish: **[As selected by Architect from manufacturer's full range] <Insert color and finish>.**
6. Mounting Hardware: Double roller brackets or endcaps, with endcap covers where exposed, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation location and conditions indicated.
7. Installation Accessories:
 - a. Double Roller Front Fascia: Aluminum extrusion that conceals front and underside of rollers and shadeband assemblies and attaches to double roller endcaps without exposed fasteners.
 - 1) Shape: **[L-shaped] [Curved] <Insert requirements>.**
 - 2) Height: **[Manufacturer's standard height required to conceal rollers and shadeband assemblies when shades are fully open] <Insert dimension>.**
 - b. Double Roller Exposed Headbox: Extruded-aluminum enclosure including front fascia, L-shaped top/back cover, and removable bottom closure, that fully conceals rollers and shadeband assemblies, and attaches to double roller endcaps without exposed fasteners.
 - 1) Size: **[Manufacturer's standard height and width required to enclose rollers and shadeband assemblies when shades are fully open] [Size indicated on Drawings] <Insert dimensions>.**
 - c. Double Roller Recessed Shade Pocket:
 - 1) U-shaped, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, and with removable bottom closure panel and endcaps or plates. **[Provide pocket with lip at lower edge to support acoustical ceiling panel.]**

- a) Size: **[Manufacturer's standard height and width required to enclose rollers and shadeband assemblies when shades are fully open] [Size indicated on Drawings] <Insert dimensions>.**
 - 2) As specified in Section 057500 "Decorative Formed Metal."
 - d. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - 1) Closure-Panel Width: **[As indicated on Drawings] <Insert dimension>.**
 - e. Side Channels: Extruded aluminum "U" channel or "L" angle with light seals designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 - f. Bottom (Sill) Channel or Angle: Extruded aluminum "U" channel or "L" angle with light seals designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: **[As selected from manufacturer's full range] <Insert color and finish>.**
- C. Motor-Operated, Skylight Roller Shades **<Insert drawing designation>**: For interior use in rectangular openings.
 1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 2. System Type: **[Double-roller, two-motor system, one for shadeband roll-up, one for cable take-up] [Single-motor, double-roller system, with motor in drive roller and spring in take-up roller] [Single motor and roller, gravity drop] <Insert description>.**
 3. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - a. Drive-End Location: **[Right side of interior face of shade] [Left side of interior face of shade] [As indicated on Drawings] <Insert requirements>.**
 - b. Direction of Shadeband Roll: **[Regular, from back (exterior face) of roller] [Reverse, from front (interior face) of roller].**
 - c. Shadeband-to-Roller Attachment: **[Manufacturer's standard method] [Adhesive strip] <Insert description>.**
 4. Shadeband Retention System: Manufacturer's standard system for guiding shadeband through range of travel and holding shadeband taut with edges of shadeband supported by side channels or angles.
 5. Shadebands:
 - a. Shadeband Material: **[Light-filtering fabric] [Light-blocking fabric] [Acoustical fabric] <Insert requirements>.**
 - b. Shadeband Bottom (Hem) Bar: Manufacturer's standard for operating mechanism indicated.
 - 1) Color and Finish of Exposed Bottom Bar: **[As selected by Architect from manufacturer's full range] <Insert color and finish>.**
 6. Mounting Hardware: Corrosion resistant and compatible with operating mechanism, installation accessories, and installation location and conditions indicated.
 7. Installation Accessories:

- a. Exposed Headboxes and Bottom Boxes: Extruded-aluminum enclosures including front fascia, L-shaped top/back covers, and removable closures, that fully conceal roller and shadeband assemblies, and attaches to roller endcaps without exposed fasteners.
 - 1) Height: Manufacturer's standard height required to enclose roller and shadeband assemblies when shade is fully open, but not less than **[height indicated on Drawings] <Insert dimension>**.
- b. Channels or Angles: Manufacturer's standard design for operating mechanism indicated and shadeband take-up and support.
- c. Installation Accessories Color and Finish: **[As selected from manufacturer's full range] <Insert color and finish>**.

2.5 MANUAL OPERATION

A. Manual Corded Operation:

- 1. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - a. Bead Chains: **[Manufacturer's standard] [Nickel-plated metal] [Stainless steel] [Plastic] <Insert description>** bead chain with WCMA A100.1 compliant tension device installed on roller window shade by manufacturer and mounted on **[wall] [jamb] [sill]**.
 - 1) Loop Length: **[Full length of roller shade] [As indicated on Drawings] <Insert length>**.
 - 2) Limit Stops: Provide upper and lower ball stops.
 - b. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - 1) Provide for shadebands that weigh more than **[10 lb (4.5 kg)] <Insert value>** or for shades as recommended by manufacturer, whichever criterion is more stringent.

B. Manual Cordless Operation:

- 1. Crank-and-Gear Operating Mechanisms: Sealed gearbox drive system controlled by crank handle.
 - a. Crank-Handle Type: **[Detachable] [Permanently mounted]**.
 - b. Crank-Handle Length: **[6 ft. (1.8 m)] [10 ft. (3 m)] [Manufacturer's standard] [As indicated on Drawings] <Insert length>**.

2.6 MOTORIZED OPERATION

- A. Motorized Operating Systems: Factory-assembled, motorized roller window shades with shade-operator system of size and capacity and with features, characteristics, and accessories required for conditions indicated, complete with motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for complete operation. For wired controls, include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Type:

1. Standard Motor with Wired Controls: Roller window shade manufacturer's standard tubular motor to suit conditions indicated, enclosed in roller.
 - a. Motor Electrical Characteristics: **[120-V ac] [24-V dc] <Insert requirements>**.
 - b. Motor Functions:
 - 1) Quiet Operation Motor: **<Insert requirements>**.
 - 2) Third-Party Integration Capability: **<Insert requirements>**.
 - 3) **<Insert description>**.
 - c. Controls:
 - 1) Wired Wall Switch:
 - a) Single Motor Control: Wired wall-switch-operated control station for single motor control, with three switch positions for open, close, and center stop functions. **[Single station, dry-contact, three-button wall switch] [Double station, dry-contact, three-button wall switch] [Maintained-contact paddle switch] [Momentary-contact paddle switch] [Maintained-contact rocker switch] [Momentary-contact rocker switch] [Maintained-contact toggle switch] [Momentary-contact toggle switch] [Maintained-contact key switch; provide two keys per station] [Momentary-contact key switch; provide two keys per station]**.
 - b) Group Motor Control, Two Motors: Wired wall-switch-operated control station for control of two motors together with single station, with three switch positions for open, close, and center stop functions. **[Maintained] [Momentary]-contact, [paddle] [rocker] switch**.
 - c) Group Motor Control, Two to Five Motors: Wired wall-switch-operated control station for control of **[two] [three] [four] [five]** motors together with single station, with five switch positions for open, close, and three preset intermediate stop position functions. **[Single station, dry-contact, five- or six-button wall switch] [Double station, dry-contact, five- or six-button wall switch]**.
 - d) Color: **[White] [Ivory] [As selected by Architect from manufacturer's full range] <Insert color>**.
 - d. Accessories:
 - 1) **<Insert description>**.
2. Radio Frequency (RF) Motor with Wireless Controls: Roller window shade manufacturer's standard tubular radio frequency motor to suit conditions indicated, enclosed in roller, communicating to control devices through wireless RF signal.
 - a. Motor Electrical Characteristics: **[120-V ac] [24-V dc] [12-V dc, battery] <Insert requirements>**.
 - b. Motor Functions:
 - 1) Quiet Operation Motor: **<Insert requirements>**.
 - 2) Third-Party Integration Capability: **<Insert requirements>**.
 - 3) **<Insert description>**.
 - c. Controls:

- 1) RF Wireless Wall Switch Transmitters:
 - a) Single Channel **[Surface-Mount]** Wall Switch: With open, close, and stop command buttons, and one channel button for operation of one motorized shade or one group of motorized shades.
 - b) Multi-Channel **[Surface-Mount]** Wall Switch: With open, close, and stop command buttons and **[two] [three] [four] [five]** channel buttons for operation of one motorized shade or one group of motorized shades per channel.
 - c) Color: **[As selected by Architect from manufacturer's full range] <Insert color>**.
- 2) RF Handheld Transmitters:
 - a) Single-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades[, **and with sun sensor control**].
 - b) Multi-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades per channel for up to five channels[, **and with sun sensor control**].
 - c) 16-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades per channel for up to 16 channels.
 - d) Color: **[As selected by Architect from manufacturer's full range] <Insert color>**.
- 3) RF Wireless Tabletop Controls:
 - a) Single Channel Tabletop Control: With open, close, and stop command buttons and one channel button for operation of one motorized shade or one group of motorized shades, compatible with RF wireless wall switch transmitters.
 - b) Multi-Channel Tabletop Control: With open, close, and stop command buttons and **[two] [three] [four] [five]** channel buttons for operation of one motorized shade or one group of motorized shades per channel, compatible with RF wireless wall switch transmitters.
 - c) Color: **[As selected by Architect from manufacturer's full range] <Insert color>**.
- 4) App-Based Mobile Device and Voice Control:
 - a) Multi-channel control for up to **[16] [40] <Insert number>** RTS channels programmable for individual or group control, schedules, scenes, or timed events, and with voice control through digital assistants.
- 5) RF Wireless Sensors:
 - a) Sun Sensor: Programmable sensor detects sun intensity and responds by automatically adjusting motorized shades.
 - b) Sun and Temperature Sensor: Programmable sensor detects sun intensity and temperature and responds by automatically adjusting motorized shades.
- 6) RF Timer Control:
 - a) Single-Channel Handheld Transmitter: For operation of one motorized shade or one group of motorized shades, programmable for weekday and weekend schedules with one open and close schedule per day.

- b) Color: **[As selected by Architect from manufacturer's full range]** <Insert color>.
 - d. Accessories:
 - 1) <Insert description>.
- 3. Intelligent Motor with Wired Controls: Roller window shade manufacturer's standard tubular intelligent motor to suit conditions indicated, enclosed in roller. Intelligent motors and controls each with individual IP addresses, communicating together with two-way communication, and connected into a digital network system.
 - a. Motor Electrical Characteristics: 120-V ac <Insert requirements>.
 - b. Motor Functions:
 - 1) Quiet Operation Motor: <Insert requirements>.
 - 2) <Insert requirements>
 - c. Network Functions:
 - 1) Standalone network.
 - 2) Integrate with building management system.
 - 3) Integrate with third-party **[lighting]** **[audiovisual (A/V)]**, **[HVAC]** <insert description> control systems.
 - 4) Whole building automation. Provide manufacturer's standard whole building automation system using web-based user interface and required devices to provide the following functions:
 - a) Automatically adjust shade positions based on sky conditions, solar heat gain, sun tracking, direct and diffuse radiation, and occupancy.
 - b) Override capability.
 - c) Integrate with building management system.
 - d) Integrate with third-party control systems including lighting control systems, audiovisual (A/V) systems, HVAC control systems and energy dashboards.
 - e) Data logging, reporting and storage.
 - f) Individual user profiles and permissions.
 - g) Programming of scheduled events.
 - h) Display and monitoring of current conditions.
 - i) Send alerts/notifications.
 - j) Configurable motor, zone, and building properties.
 - k) <Insert requirements>
 - 5) <Insert requirements>
 - d. Controls:
 - 1) Master-Controlled/Central Network Controller: Touchscreen device for whole building automation control.
 - 2) Wired Wall Switch:
 - a) Single Zone Intelligent **[Push-Button]** **[Touch or Swipe]** Wall Switch: For control of one motorized shade or one zone composed of any number of motorized shades in the network.
 - b) Dual Zone Intelligent **[Push-Button]** **[Touch or Swipe]** Wall Switch: For control of two individual zones, each zone composed of any number of motorized shades in the network.

- c) Color: **[As selected by Architect from manufacturer's full range]** <Insert color>.
- 3) Wireless Handheld Remote:
 - a) Multi-Channel RF Handheld **[Push-Button]** **[Touch or Swipe]** Remote: For wireless control of one motorized shade or one group of motorized shades per channel for up to 32 channels. Provide manufacturer's standard network gateway device to enable use of wireless control device on wired network.
 - b) Color: **[As selected by Architect from manufacturer's full range]** <Insert color>.
- 4) Wired Sensors:
 - a) Internal Daylight Sensor: Measures daylight levels through glazing and responds by automatically adjusting motorized shades. Provide manufacturer's standard network interface device **[with automated glare control,]** to connect sensors to network. Interface device to allow programming for up to **[eight]** <insert number> scheduled events.
 - b) External Brightness Sensor: Measures brightness levels and responds by automatically adjusting motorized shades. Provide manufacturer's standard network interface device **[with automated glare control,]** to connect sensors to network. Interface device to allow programming for up to **[eight]** <insert number> scheduled events.
 - c) **<Insert sensor>**.
- C. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
- D. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
- E. Maximum Total Shade Width: **[As required to operate roller shades indicated]** <Insert requirements>.
- F. Maximum Shade Drop: **[As required to operate roller shades indicated]** <Insert requirements>.
- G. Maximum Weight Capacity: **[As required to operate roller shades indicated]** <Insert requirements>.

2.7 SHADEBAND MATERIALS

- A. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: **[Roller shade manufacturer]** <Insert source for custom fabrics>.
 - 2. Type: **[PVC-coated fiberglass]** **[PVC-coated polyester]** **[Woven 100 percent polyester]** **[100 percent fiberglass]** **[Thermoplastic Olefin (TPO)]** **[Acrylic-coated polyester]** **[Woven PVC-coated fiberglass and PVC-coated polyester]** **[Woven polyester and PVC-coated polyester]** **[PVC-coated polyester with silver backing]** <Insert description>.
 - 3. Weave: **[Mesh]** **[Basketweave]** <Insert description>.
 - 4. Thickness: <Insert thickness>.
 - 5. Weight: <Insert oz./sq. yd. (g/sq. m)>.
 - 6. Roll Width: **[36 inches (914 mm)]** **[48 inches (1229 mm)]** **[60 inches (1524 mm)]** **[72 inches (1829 mm)]** **[84 inches (2134 mm)]** <Insert dimension>.
 - 7. Orientation on Shadeband: **[Up the bolt]** **[Railroaded]** **[As indicated on Drawings]** <Insert requirements>.

8. Openness Factor: [0.5] [1] [3] [5] [10] [11] [22] <Insert number> percent.
9. Color: [As indicated on Drawings] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

B. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: [Roller shade manufacturer] <Insert source for custom fabrics>.
2. Type: [Fiberglass with PVC film bonded to both sides] [Fiberglass with acrylic flocked backing] [Woven 100 percent polyester] [Acrylic-coated polyester] [Polyester-acrylic blend] [Polyester with acrylic foamed backing] [PVC-coated fiberglass with bonded PVC film] [Fiberglass with EVA coating] [PVC-coated polyester with silver backing] <Insert description>.
3. Thickness: <Insert thickness>.
4. Weight: <Insert oz./sq. yd. (g/sq. m)>.
5. Roll Width: [36 inches (914 mm)] [48 inches (1229 mm)] [60 inches (1524 mm)] [72 inches (1829 mm)] [84 inches (2134 mm)] <Insert dimension>.
6. Orientation on Shadeband: [Up the bolt] [Railroaded] [As indicated on Drawings] <Insert requirements>.
7. Features: [Washable] [Antistatic treatment] <Insert requirements>.
8. Color: [As indicated on Drawings] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

C. Acoustical Fabric: Woven fabric, stain and fade resistant.

1. Source: [Roller shade manufacturer] <Insert source for custom fabrics>.
2. Type: [Woven 100 percent polyester] [Thermoplastic Olefin (TPO)] [PVC-coated fiberglass] [PVC-coated polyester] <Insert description>.
3. Acoustical Performance: Sound absorption [NRC] [or] [SAA] of [0.60 to 0.70] [0.50 to 0.60] [0.40 to 0.50] [0.30 to 0.40] [0.20 to 0.30] [not less than 0.50] <Insert range or single value> in accordance with ASTM C423 for Type G mounting in accordance with ASTM E795.
4. Thickness: [As required to meet acoustical performance] <Insert thickness>.
5. Weight: [As required to meet acoustical performance] <Insert oz./sq. yd. (g/sq. m)>.
6. Roll Width: [36 inches (914 mm)] [48 inches (1229 mm)] [60 inches (1524 mm)] [72 inches (1829 mm)] [84 inches (2134 mm)] <Insert dimension>.
7. Orientation on Shadeband: [Up the bolt] [Railroaded] [As indicated on Drawings] <Insert requirements>.
8. Features: [Washable] [Antistatic treatment] <Insert requirements>.
9. Openness Factor: [0.5] [1] [3] [As required to meet acoustical performance] <Insert number> percent.
10. Color: [As indicated on Drawings] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

2.8 FABRICATION OF ROLLER WINDOW SHADES

A. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13 mm) total, plus or minus 1/8 inch (3 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3 mm).
2. Outside of Jamb Installation: Width and length as indicated [in window-treatment schedule] [on Drawings] <Insert requirements>, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

- B. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than [1:4] <Insert ratio>, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
 3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, **[locations of connections to building electrical system]**, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ROLLER WINDOW SHADES

- A. Install roller shades level, plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
1. Located so shadeband is not closer than **[2 inches (51 mm)]** <Insert dimension> to interior face of glass. Allow clearances for window operation hardware.
- B. Roller Shade Locations: **[At exterior windows]** **[As indicated in window-treatment schedule]** **[As indicated on Drawings]** <Insert requirements>.
- C. Electrical:
1. Connect motor-operated roller window shades to building electrical system.
 2. Comply with manufacturer's written installation instructions.

3.3 ADJUSTING

- A. Adjust and balance roller window shades to operate smoothly, easily, safely, and free from binding or malfunction through full operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller window shade surfaces, after installation, in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller window shades are without damage or deterioration at time of Substantial Completion.
- C. Protect electrical[**and communications**] wiring, cabling, raceways, and boxes, after installation. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use, before time of substantial completion.
- D. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller window shades.

END OF SECTION 12 24 13 00



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SECTION 12 24 13 00a - PLEATED WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Z-pleated shades.
2. Cellular pleated shades.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting pleated shades and accessories.
2. Section 260010 "Supplemental Requirements for Electrical" for additional requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - b. Include rated capacities, operating characteristics, **electrical characteristics**, features, and furnished accessories.
 - c. **<Insert requirements>**.

B. Shop Drawings:

1. Include fabrication and installation details for pleated shades.
2. Motorized Units: Include diagrams for power, signal, and control wiring.
3. **<Insert requirements>**.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of pleated shade and for each type of exposed finish.

1. Include Samples of accessories involving color selection.

- D. Samples for Verification: Actual sample of finished products for each type and color of pleated shade.
 - 1. Size: **[Manufacturers' standard size]** <Insert size>.
- E. Product Schedule: For pleated shades. **[Use same designations indicated on Drawings.]**
- F. Sustainable Design Submittals:
 - 1. <Double click to insert sustainable design text for recycled content.>
 - 2. <Double click to insert sustainable design text for formaldehyde emissions>

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of pleated shade, for tests performed by **[a qualified testing agency]** **[manufacturer and witnessed by a qualified testing agency]**.
- B. Qualification Statements: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pleated shades.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, **[from the same production run,]** to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Pleated Shades: Full-size units equal to **[5]** <Insert number> percent of quantity installed for each size, color, texture, and pattern indicated, but no fewer than **[two]** <Insert number> units. Include mounting accessories.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.9 MOCKUPS

- A. Install **[one]** <Insert number> of each type of pleated window shade as a mockup to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pleated shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install pleated shades until construction and finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where pleated shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Defects in materials and workmanship excluding normal wear and tear.
 - b. Faulty operation of operating system components.
 - 2. Warranty Period:
 - a. Pleated Shades: **[Non-transferrable limited lifetime] [Three years from date of Substantial Completion] <Insert requirements>.**
 - b. Motorization Components: **[Five years] <Insert period>** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of pleated window shades from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide pleated window shades that comply with WCMA A100.1[**and are listed and labeled as "Best for Kids" by a qualified testing agency**].
- B. Fire Performance: Tested in accordance with, and meeting the flame propagation performance criteria of Test 1 or Test 2, as appropriate, of NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Drapery Operators: UL CCN FDDR, including UL 325.
 2. <Double click to insert sustainable design text for formaldehyde emissions>

2.3 Z-PLEATED SHADES

- A. Z-Pleated Shades: Permanently creased, horizontally folded shades that maintain uniform spacing between folds (pleats).
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 2. Nominal Pleat Width: **[1 inch (25 mm)] [2 inches (51 mm)] <Insert dimension>**.
 3. Shade Fabric: Stain and fade resistant**[with back ladder support]**.
 - a. Type: **[Manufacturer's standard] [Antistatic polyester] <Insert requirements>**.
 - b. Pattern: **[As indicated in window-treatment schedule] <Insert requirements>**.
 - c. Color: **[Match Architect's samples] [As selected by Architect from manufacturer's full range] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
 - d. Material Solar-Optical Properties: **<Insert requirements>**.
 - e. Material Openness Factor: **<Insert number>** percent.
 - f. Material UV Blockage: **<Insert number>** percent.
 4. Fabric Liner: **[Light blocking] [Room darkening] <Insert requirements>**.
 5. Headrail: Extruded aluminum. Headrails fully enclose operating mechanisms on three sides and have capped ends.
 - a. Capacity: **[One shade per headrail] [Two shades per headrail] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
 6. Manual Corded Operation: **[Bottom up] [Top down/bottom up]**.
 - a. Operating Mechanism: Manufacturer's standard **[cordlock] [continuous-loop cord and clutch]** system.
 - 1) Cordlock Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when shade is fully closed] [Inaccessible cord, not greater than 12 inches (305 mm) when shade is fully closed]**.
 - 2) Continuous-Loop Cord-Retainer: WCMA A100.1 compliant tension device installed on pleated window shade by manufacturer and mounted on **[wall] [jamb] [sill]**.
 - 3) Operating Cord Location: **[Manufacturer's standard] [Right side of headrail] [Left side of headrail] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
 7. Manual Cordless Operation: **[Bottom up] [Top down/bottom up]**.

- a. Operating Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows shades to be raised or lowered by manually pushing the bottom rail up or pulling it down.
8. Motorized Operation: Provide factory-assembled motorized shades with shade-operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system. Provide **[bottom-up]** **[bottom-up/top-down]** shade operation.
 - a. Power: **[Hard wired as indicated on Drawings]** **[Lithium battery]** **[Rechargeable battery]** **[Manufacturer's standard]** **<Insert requirements>**.
 - b. Maximum Operating-Noise Level: **[40 db]** **<Insert requirements>**.
 - c. Motor Type: **[Radio frequency]** **<Insert requirements>**.
 - d. Controls:
 - 1) Multi-Channel Handheld Remote Control: Manufacturer's standard multi-channel remote for individual or group control for up to **[15]** **<Insert number>** channels.
 - 2) App-Based Mobile Device and Voice Control: Programmable for individual or group control, schedules, scenes, or timed events, and with voice control through digital assistants.
 - 3) **<Insert requirements>**.
 - e. Travel Limit/Stop: Adjustable control, interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
9. Bottom Rail: Formed-steel or extruded-aluminum tube that secures end of shade fabric and has capped ends.
10. Side Channels: Manufacturer's standard to reduce light gaps at sides of shades.
11. Mounting Brackets: With spacers and shims required for shade placement and alignment indicated.
 - a. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by shade manufacturer for weight and size of shade.
12. Hold-Down Brackets: Manufacturer's standard.
13. Valance: **[Manufacturer's standard]** **<Insert requirements>**.
14. Component Colors: Provide rails, cords, and other materials exposed to view in colors **[as selected by Architect from manufacturer's full range]** **<Insert requirements>**.

2.4 CELLULAR PLEATED SHADES

- A. Cellular Pleated Shades: Horizontally folded shades with multiple fabric layers that form accordion folds that enclose airspaces or cells between the fabric layers.
 1. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
 2. Construction: **[Single cell, two]** **[Double cell, three]** **[Triple cell, four]**-fabric thicknesses.
 3. Nominal Pleat Width: **[3/8 inch (10 mm)]** **[1/2 inch (13 mm)]** **[9/16 inch (14 mm)]** **[3/4 inch (19 mm)]** **[1-1/4 inches (32 mm)]** **<Insert dimension>**.
 4. Shade Face Fabric: Stain and fade resistant.
 - a. Type: **[Manufacturer's standard]** **[Antistatic polyester]** **<Insert requirements>**.
 - b. Pattern: **[As indicated in window-treatment schedule]** **<Insert requirements>**.
 - c. Color: **[Match Architect's samples]** **[As selected by Architect from manufacturer's full range]** **[As indicated in window-treatment schedule]** **[As indicated on Drawings]** **<Insert requirements>**.

5. Shade Backup Fabric: Stain and fade resistant.
 - a. Type: **[Manufacturer's standard] [Matching face fabric] <Insert requirements>**.
 - b. Color: **[White] [Manufacturer's standard] [As selected by Architect from manufacturer's full range] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
6. Headrail: Extruded aluminum. Headrails fully enclose operating mechanisms on three sides and have capped ends.
 - a. Capacity: **[One shade per headrail] [Two shades per headrail] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
7. Manual Corded Operation: **[Bottom up] [Top down/bottom up]**.
 - a. Operating Mechanism: Manufacturer's standard **[cordlock] [continuous-loop cord and clutch]** system.
 - b. Cordlock Lift-Cord Length: **[Short cord, not greater than 8 inches (203 mm) when shade is fully closed] [Inaccessible cord, not greater than 12 inches (305 mm) when shade is fully closed]**.
 - 1) Continuous-Loop Cord-Retainer: WCMA A100.1 compliant tension device installed on pleated window shades by manufacturer and mounted on **[wall] [jamb] [sill]**.
 - 2) Operating Cord Location: **[Manufacturer's standard] [Right side of headrail] [Left side of headrail]** unless otherwise indicated.
8. Manual Cordless Operation: **[Bottom up] [Top down/bottom up]**.
 - a. Operating Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows shades to be raised or lowered by manually pushing the bottom rail up or pulling it down.
9. Motorized Operation: Provide factory-assembled motorized shades with shade-operator systems of size and capacity, and with features, characteristics, and accessories required for conditions indicated. Coordinate electrical requirements with building electrical system. Provide **[bottom-up] [bottom-up/top-down]** shade operation.
 - a. Power: **[Hard wired as indicated on Drawings] [Lithium battery] [Rechargeable battery] [Manufacturer's standard] <Insert requirements>**.
 - b. Maximum Operating-Noise Level: **[40 db] <Insert requirements>**.
 - c. Motor Type: **[Radio frequency] <Insert requirements>**.
 - d. Controls:
 - 1) Multi-Channel Handheld Remote Control: Manufacturer's standard multi-channel remote- for individual or group control for up to **[15] <Insert number>** channels.
 - 2) App-Based Mobile Device and Voice Control: Programmable for individual or group control, schedules, scenes, or timed events, and with voice control through digital assistants.
 - 3) **<Insert requirements>**.
 - e. Travel Limit/Stop: Adjustable control, interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
10. Bottom Rail: Formed-steel or extruded-aluminum tube that secures end of shade fabric and has capped ends.

11. Mounting Brackets: With spacers and shims required for shade placement and alignment indicated.
 - a. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by shade manufacturer for weight and size of shade.
12. Hold-Down Brackets: Manufacturer's standard.
13. Valance: **[Manufacturer's standard] <Insert requirements>**.
14. Component Colors: Provide rails, cords, and other materials exposed to view in colors **[as selected by Architect from manufacturer's full range] <Insert requirements>**.

2.5 FABRICATION OF PLEATED SHADES

- A. Unit Sizes: Fabricate units in sizes to cover window and other openings as follows, measured at 74 deg F (23 deg C):
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3 mm).
 2. Outside of Jamb Installation: Width and length as indicated **[in window-treatment schedule] [on Drawings] <Insert requirements>**, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Fabric Shades: Fabricate without seams to the greatest extent possible from fabric length as it comes off the roll oriented vertically on shades.
 1. Where seams are required by maximum fabric width, locate as indicated **[in window-treatment schedule] [on Drawings] <Insert requirements>**.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade; for supporting headrail, valance, and operating hardware; and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: At least two fasteners per bracket. Fabricated from metal noncorrosive to brackets and adjoining construction. Of type designed for securing to supporting construction and for supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, unless anodized or plated finish is indicated, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, **[locations of connections to building electrical system]**, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLEATED SHADES

- A. Install pleated shades level and plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
 - 1. Locate so exterior shade edges are not closer than **[2 inches (51 mm)] <Insert dimension>** from interior faces of glass and not closer than **[1-1/2 inches (38 mm)] <Insert dimension>** from interior faces of glazing frames through full operating ranges of shades.
 - 2. Install mounting brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent shades, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.
- B. Pleated-Shade Locations: **[At exterior windows] [As indicated in window-treatment schedule] [As indicated on Drawings] <Insert requirements>**.
- C. Electrical Connections: Connect hard-wired motorized operators to building electrical system.

3.3 ADJUSTING

- A. Adjust and balance pleated shades to operate smoothly, easily, safely, and free from binding or malfunction through full operational range.

3.4 CLEANING AND PROTECTION

- A. Clean pleated-shade surfaces after installation, in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that pleated shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged pleated shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized operators for pleated shades.

END OF SECTION 12 24 13 00a



Task	Specification	Specification Description
12 24 13 00	12 21 13 00	Horizontal Louver Blinds
12 24 13 00	12 21 16 00	Vertical Louver Blinds
12 25 09 00	01 11 19 00	No Specification Required



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SECTION 12 30 00 00 - MANUFACTURED WOOD-VENEER-FACED CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-veneer-faced casework.
2. Hardware and accessories.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood-veneer-faced casework.
4. Section 123553.19 "Wood Laboratory Casework."
5. Section 123619 "Wood Countertops."

1.2 DEFINITIONS

- A.** Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1.3 PREINSTALLATION MEETINGS

- A.** Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
- B.** Keying Conference: Conduct conference at **[Project site]<Insert location>**. Incorporate keying conference decisions into final keying requirements.

1.4 COORDINATION

- A.** Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Wood-veneer-faced casework.
2. Hardware and accessories.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content

- and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.
12. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
13. Chain-of-Custody Qualification Data: For manufacturer and vendor.
14. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
15. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
16. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
17. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
18. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For wood-veneer-faced casework.

1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
6. Apply **[AWI's Quality Certification][WI's Certified Compliance]** Program label to Shop Drawings.

D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

E. Samples: For casework and hardware finishes.

F. Samples for Initial Selection: For casework and hardware finishes.

G. Samples for Verification: For the following:

1. Casework Finishes: **8-by-10-inch (200-by-250-mm)** Samples for each type and color of finish.
2. Base Cabinet: One full-size, **[16-inch- (406-mm-)]<Insert dimension>** wide, finished base

- cabinet complete with hardware, doors, and drawers but without countertop.
3. Wall Cabinet: One full-size, [12-inch- (304-mm-)]<Insert dimension> wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 4. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [casework manufacturer][and][Installer].
- B. Sample Warranty: For special warranty.
- C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: [AWI's Quality Certification Program][WI's Certified Compliance Program] certificates.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each casework finish provided. Include fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: [An authorized representative who is trained and approved by manufacturer][and][licensed participate in AWI's Quality Certification Program][licensed participate in WI's Certified Compliance Program].

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during remainder of construction period. [**Maintain temperature and relative humidity during remainder of construction period in range recommended for Project location by the AWI/AWMAC/WI's "Architectural Woodwork Standards."**]
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - d. Deterioration of finishes.
 - 2. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CASEWORK

- A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: **[Premium][Custom][Economy]**.
 - 2. Provide labels and certificates from **[AWI][WI]** certification program indicating that casework complies with requirements of grades specified.
 - a. This Project has been registered with AWI as AWI's Quality Certification Program Number **<Insert number>**.
 - b. Contractor to register the Work under this Section with the AWI Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.
- B. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site

from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.

- C. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Wood products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- H. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- I. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- J. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- K. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- L. Product Designations:
 - 1. Drawings indicate sizes, configurations, and finish materials of manufactured wood-veneer-faced casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."
 - 2. Drawings indicate configurations of manufactured wood-veneer-faced casework by referencing designations of Casework Design Series numbering system in the Appendix of the AWI/AWMAC/WI's "Architectural Woodwork Standards."

2.2 WOOD-VENEER-FACED CASEWORK

- A. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

1. [CIF Lab Solutions LP]
 2. [ICIScientific]
 3. [Kewaunee Scientific Corporation]
 4. [TMI Systems Corporation]
 5. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [CIF Lab Solutions LP]
 2. [ICIScientific]
 3. [Kewaunee Scientific Corporation]
 4. [TMI Systems Corporation]
 5. <Insert manufacturer's name>
- C. Source Limitations: Obtain from single source from single manufacturer.
- D. Design: [Face-frame][Frameless] cabinet construction with the following door and drawer-front style:
1. Lipped overlay with radiused wood edges[and full-width, recessed finger pulls machined into faces of doors and drawers].
 2. Reveal overlay[with recessed finger pulls machined into faces of doors and drawers].
 3. Flush overlay.
- E. Wood Species: [Red oak][White birch][Red birch][Alder][White maple][Hickory]<Insert requirements>.
1. Wood Stain Colors and Finishes: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from casework manufacturer's full range]<Insert requirements>.
- F. Face Veneer Cut: [Plain sliced][Quarter sliced][Rift cut][Rotary cut]<Insert requirements>.
- G. Veneer Matching:
1. None required; select and arrange veneers for compatible grain and color.
 2. Provide veneers for each cabinet from a single flitch, [book and running][slip and running][book or slip and running][book and balance][slip and balance][book or slip and balance] matched.
 - a. Provide continuous matching of adjacent drawer fronts within each cabinet.
 3. Provide veneers for each elevation from a single flitch, [book and running][slip and running][book or slip and running][book and balance][slip and balance][book or slip and balance] matched.
 - a. Provide continuous matching of adjacent drawer fronts within each cabinet and end matching between drawer fronts of adjacent cabinets.
- H. Grain Direction:
1. Doors: Vertical with continuous vertical matching.
 2. Drawer Fronts: [Vertical with continuous vertical matching][Horizontal].
 3. Face Frame Members: Lengthwise.
 4. End Panels: Vertical.

5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

I. Exposed Materials:

1. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Provide backs of same species as faces.
2. Solid Wood: Clear hardwood lumber of species indicated and selected for grain and color compatible with exposed plywood.
3. Edgebanding: **[Solid wood, minimum 1/8 inch (3 mm) thick and of same species as face veneer][Wood veneer of same species as face veneer][PVC]**.
 - a. PVC Edgebanding Color: **[Casework manufacturer's standard][As selected by Architect from casework manufacturer's full range]<Insert requirements>**.

J. Semiexposed Materials:

1. Wood: Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
 - a. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of **[species similar in color and grain to][same species as]** exposed wood.
 - b. Plywood: Hardwood plywood of **[species similar in color and grain to][same species as]** exposed wood. Provide backs of same species as faces.
2. Thermally Fused Laminate (TFL) Panels: Provide thermally fused laminate panels for semiexposed surfaces, except provide solid wood or hardwood plywood for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
 - a. Colors and Patterns: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert requirements>**.
3. Hardboard: Use only for cabinet backs where exterior side of back is not exposed.
4. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

K. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware: Unless otherwise indicated, provide manufacturer's standard **[satin-finish][mirror polished-finish][powder-coated]**, commercial-quality, heavy-duty hardware.
 1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: **[Stainless steel][Chrome-plated][Powder-coated]**, semiconcealed, five-knuckle hinges complying with ANSI/BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two

hinges for doors less than **48 inches (1220 mm)** high, and provide three hinges for doors more than **48 inches (1220 mm)** high.

- C. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, Type B01602[, **self-closing**]. Provide two hinges for doors less than **48 inches (1220 mm)** high, and provide three hinges for doors more than **48 inches (1220 mm)** high.
 - 1. Degrees of Opening: [**100**][**135**][**170**] degrees.
- D. Wire Pulls: Solid [**nylon**][**aluminum**][**stainless steel**][or][**chrome-plated brass**] wire pulls, fastened from back with two screws.
 - 1. For sliding doors, provide recessed [**stainless steel**][or][**chrome-plated**] flush pulls.
 - 2. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- E. Semirecessed Pulls: Plastic. For sliding doors, provide recessed plastic flush-pulls. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- F. Door Catches: [**Zinc-plated**][**Powder-coated**], [**nylon-roller spring catch**][or][**dual, self-aligning, permanent magnet catch**]. Provide two catches on doors more than **48 inches (1220 mm)** high.
- G. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.
 - 1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
 - 2. Drawers: Provide one bumper on back side of drawer front at each corner.
- H. Drawer Slides: ANSI/BHMA A156.9.
 - 1. Manufacturer's standard.
 - 2. Standard Duty (Grade 1): [**Side mount**][**Undermount**].
 - 3. Heavy Duty (Grade 1HD-100): [**Side mount**][**Undermount**].
 - a. Type: [**Full**][**Full overtravel**][**Partial**] extension.
 - b. Material: [**Epoxy-coated polymer**][**Zinc-plated ball bearing**] slides.
 - c. Motion Feature: [**Soft close dampener**][**Self-closing mechanism**].
 - 4. General-purpose drawers; provide [**100 lb (45 kg)**]<Insert weight> load capacity.
 - 5. File drawers; provide [**150 lb (45 kg)**]<Insert weight> load capacity.
- I. Label Holders: [**Stainless steel**][or][**chrome plated**], sized to receive standard label cards approximately **1 by 2 inches (25 by 51 mm)**, and attached with screws or brads.
 - 1. Provide label holders [**where indicated**][**on drawers**].
- J. Drawer and Hinged-Door Locks: [**Cylindrical (cam)**][**Mortise**] type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.
 - 1. Provide a minimum of two keys per lock and six master keys.
 - 2. Provide locks [**where indicated**][**on every door and drawer**].
 - a. Master key for up to [**500**]<Insert number> key changes.
- K. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.

L. Adjustable Shelf Supports:

1. Pin-type, [two-pin-locking plastic shelf rests complying with ANSI/BHMA A156.9, Type B04013][single-pin metal shelf rests complying with ANSI/BHMA A156.9, Type B04013].
2. Mortise-type, [zinc-plated][powder-coated] steel standards and shelf rests complying with ANSI/BHMA A156.9, Type B04071 and Type B04091.

2.4 MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.
- B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- D. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- G. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
- H. Softwood Plywood: DOC PS 1.
- I. Particleboard: ANSI A208.1, Grade M-2.
 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- J. MDF: Medium-density fiberboard, ANSI A208.2, [**Grade 130**]**<Insert grade>**.
 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- K. Hardboard: ANSI A135.4, Class 1 tempered.
 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- L. PVC Edgebanding for Wood: Rigid PVC extrusions, through color with satin finish, 3.0 mm thick at doors and drawer fronts, 1.0 mm thick elsewhere.

- M. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper[**and complying with requirements of ISO 4586**].
 - 1. Edgebanding for Thermally Fused Laminate (TFL) Panels: PVC or polyester edgebanding matching thermally fused laminate panels.
- N. Glass for Glazed Doors:
 - 1. Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than **[3.0 mm][4.0 mm][5.0 mm][6.0 mm]** thick.
 - 2. Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
 - 3. Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- O. Frameless Glass Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than **[5.0 mm][6.0 mm]** thick; with exposed edges seamed before tempering.
- P. Adhesives: Do not use adhesives that contain urea formaldehyde.
- Q. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- R. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- S. Adhesives: Do not use adhesives that contain urea formaldehyde.
- T. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

- A. Wood-Veneer-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:
 - 1. Bottoms of Cabinets and Tops of Wall Cabinets: **3/4-inch- (19-mm-)** thick, [**veneer-core**]hardwood plywood.
 - 2. Ends of Cabinets: **3/4-inch- (19-mm-)** thick, hardwood plywood.
 - 3. Shelves: **3/4-inch- (19-mm-)** thick, veneer-core hardwood plywood or **1-inch- (25-mm-)** thick, particleboard-core hardwood plywood.
 - 4. Base Cabinet Top Frames: **3/4-by-2-inch (19-by-51-mm)** solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
 - 5. Base Cabinet Stretchers: **3/4-by-4-1/2-inch (19-by-114-mm)** plywood, particleboard, or MDF strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed.[**May be provided as an option to base cabinet top frames.**]
 - 6. Base Cabinet Subtops: **3/4-inch- (19-mm-)** thick panel product, glued and pinned or screwed.[**May be provided as an option to base cabinet top frames.**]
 - 7. Backs of Cabinets: **3/4-inch- (19-mm-)** thick, particleboard-core hardwood plywood where exposed, [**1/4-inch- (6.4-mm-) thick hardboard**][**1/4-inch- (6.4-mm-) thick, veneer-core hardwood plywood**][**1/2-inch- (13-mm-) thick hardwood plywood**], dadoed into sides,

- bottoms, and tops where not exposed.
8. Drawer Fronts: **3/4-inch- (19-mm-)** thick, particleboard-core hardwood plywood or solid hardwood.
 9. Drawer Sides and Backs: **1/2-inch- (13-mm-)** thick, solid-wood or [**veneer-core**]hardwood plywood, with glued dovetail or multiple-dowel joints.
 10. Drawer Bottoms: **1/4-inch- (6.4-mm-)** thick, veneer-core hardwood plywood, glued and dadoed into front, back, and sides of drawers. [**Use 1/2-inch- (13-mm-) thick material for drawers more than 24 inches (600 mm) wide.**]
 11. Drawer Bodies: Steel drawer pans formed from **0.036-inch- (0.91-mm-)** thick metal, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat and **2 mils (0.05 mm)** for system.
 12. Cabinet Doors:
 - a. 48 Inches (1220 mm) or Less in Height: **3/4 inch (19 mm)** thick, with[**solid hardwood stiles and rails,**] particleboard or MDF cores, and hardwood face veneers and crossbands.
 - b. 48 Inches (1220 mm) or More in Height: [**1-1/16 inches (27 mm) thick, with solid hardwood stiles and rails, honeycomb cores,**][**1-1/8 inches (29 mm) thick, with particleboard cores**] and hardwood face veneers and crossbands.
- B. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework.

2.6 FINISH

- A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors and drawer fronts and molded shapes with profile-edge sander. Sand casework after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform color and to match approved Samples.
- C. Finishing Closed-Grain Woods: Apply manufacturer's standard two-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat. Topcoat may be omitted on concealed surfaces.
- D. Finishing Open-Grain Woods: Apply manufacturer's standard three-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and two coats of a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat and between topcoats. Topcoats may be omitted on concealed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Grade: Install casework to comply with same quality standard grade as item to be installed.
- B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within **1/16 inch (1.5 mm)** of a single plane. Align similar adjoining doors and drawers to a tolerance of **1/16 inch (1.5 mm)**. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within **1/16 inch (1.5 mm)** of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of **1/16 inch (1.5 mm)**.
- E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through **[AWI's Quality Certification Program][WI's Certified Compliance Program]** certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity to prepare and submit report of inspection.

3.4 CLEANING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 12 30 00 00

SECTION 12 30 00 00A - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad casework.
2. Hardware and accessories.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-clad casework.
4. Section 123553.16 "Plastic-Laminate Laboratory Casework."
5. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 DEFINITIONS

- A. Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
- B. Keying Conference: Conduct conference at **[Project site]<Insert location>**. Incorporate keying conference decisions into final keying requirements.

1.4 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad casework.
2. Hardware and accessories.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content

and cost.

2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Environmental Product Declaration (EPD): For each product.
4. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
5. Environmental Product Declaration: For each product.
6. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Environmental Product Declaration (EPD): Provide one of the following EPDs: critically reviewed life-cycle assessment complying with ISO 14044; internally reviewed, product-specific Type III EPD; third-party-verified, industrywide Type III EPD.
12. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
13. Chain-of-Custody Qualification Data: For manufacturer and vendor.
14. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
15. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
16. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
17. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
18. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
19. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
20. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
21. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
22. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
23. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For plastic-laminate-clad casework.

1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
6. Apply **[AWI's Quality Certification][WI's Certified Compliance]** Program label to Shop Drawings.

D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

E. Samples: For casework and hardware finishes.

- F. Samples for Initial Selection: For casework and hardware finishes.
- G. Samples for Verification: For the following:
 - 1. Plastic Laminates: [8 by 10 inches (200 by 250 mm)][12 by 12 inches (300 by 300 mm)]<Insert dimensions>, for each type, color, pattern, and surface finish.
 - a. Provide one Sample applied to core material with specified edge material applied to one edge.
 - 2. Thermally Fused Laminate Panels: [8 by 10 inches (200 by 250 mm)][12 by 12 inches (300 by 300 mm)]<Insert dimensions>, for each color, pattern, and surface finish.
 - a. Provide edge banding on one edge.
 - 3. Base Cabinet: One full-size, [16-inch- (406-mm-)]<Insert dimension> wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
 - 4. Wall Cabinet: One full-size, [12-inch- (304-mm-)]<Insert dimension> wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 - 5. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [casework manufacturer][and][Installer].
- B. Sample Warranty: For special warranty.
- C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: [AWI's Quality Certification Program][WI's Certified Compliance Program] certificates.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: [An authorized representative who is trained and approved by

manufacturer][and][Licensed participate in AWI's Quality Certification Program][Licensed participate in WI's Certified Compliance Program].

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during remainder of construction period. [**Maintain temperature and relative humidity during remainder of construction period in range recommended for Project location by the AWI/AWMAC/WI's "Architectural Woodwork Standards."**]
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - 2. Warranty Period: [**Five**]**<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CASEWORK

- A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: [**Premium**][**Custom**][**Economy**].

2. Provide labels and certificates from [AWI][WI] certification program indicating that casework complies with requirements of grades specified.
 - a. This Project has been registered with AWI as AWI's Quality Certification Program Number **<Insert number>**.
 - b. Contractor to register the Work under this Section with AWI's Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.
- B. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- C. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site.
- D. Regional Materials: Wood products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- E. Indigenous Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- F. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- G. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- H. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- I. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- J. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- K. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- L. Product Designations:
 1. Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-clad casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."
 2. Drawings indicate configurations of manufactured plastic-laminate-clad casework by referencing

designations of Casework Design Series numbering system in the Appendix of the AWI/AWMAC/WI's "Architectural Woodwork Standards."

2.2 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Advanced Cabinet Systems (ACS)]**
2. **[Case Systems Inc]**
3. **[CIF Lab Solutions LP]**
4. **[Hausmann Industries]**
5. **[ICIsScientific]**
6. **[Mica-Tec]**
7. **[R. C. Smith Company]**
8. **[Sidney Millwork Company]**
9. **[Stevens Industries, Inc.]**
10. **[TMI Systems Corporation]**
11. **[Windham Millwork, Inc]**
12. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Advanced Cabinet Systems (ACS)]**
2. **[Case Systems Inc]**
3. **[CIF Lab Solutions LP]**
4. **[Hausmann Industries]**
5. **[ICIsScientific]**
6. **[Mica-Tec]**
7. **[R. C. Smith Company]**
8. **[Sidney Millwork Company]**
9. **[Stevens Industries, Inc.]**
10. **[TMI Systems Corporation]**
11. **[Windham Millwork, Inc]**
12. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain from single source from single manufacturer.

- D. Design: **[Face-frame][Frameless]** cabinet construction with the following door and drawer-front style:

1. Lipped overlay with radiused wood edges **[and full-width, recessed finger pulls machined into faces of doors and drawers]**.
2. Reveal overlay **[with recessed finger pulls machined into faces of doors and drawers]**.
3. Flush overlay.

- E. Grain Direction for Wood-Grain Plastic Laminate:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: **[Vertical with continuous vertical matching][Horizontal]**.
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.

6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

F. Exposed Materials:

1. Plastic-Laminate Grade: **[HGS][VGS]**.
 - a. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.
2. Edgebanding: **[Plastic laminate matching adjacent surfaces][PVC]**.
 - a. PVC Edgebanding Color: **[Casework manufacturer's standard][As selected by Architect from casework manufacturer's full range]<Insert requirements>**.
3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
 - a. Wood Species: **[Red oak][White birch][Alder][White maple][Hickory][Cherry]<Insert species>**.
 - b. Wood Finish: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from casework manufacturer's full range]<Insert requirements>**.

G. Semiexposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.
 - a. Colors and Patterns: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert requirements>**.
 - b. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
2. Thermally Fused Laminate (TFL) Panels: Provide thermally fused laminate panels for semiexposed surfaces unless otherwise indicated.
 - a. Colors and Patterns: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert requirements>**.
 - b. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
3. Hardboard: Use only for cabinet backs where exterior side of back is not exposed.
4. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
5. Unless otherwise indicated, provide specified edgebanding on all semiexposed edges.

H. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood.
3. Plastic Laminate: Grade VGS.
4. Particleboard.
5. MDF.
6. Hardboard.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware: Unless otherwise indicated, provide manufacturer's standard **[satin-finish][mirror polished-finish][powder-coated]**, commercial-quality, heavy-duty hardware.
 - 1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: **[Stainless steel][Chrome-plated][Powder-coated]**, semiconcealed, five-knuckle hinges complying with ANSI/BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than **48 inches (1220 mm)** high, and provide three hinges for doors more than **48 inches (1220 mm)** high.
- C. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, Type B01602[, **self-closing**]. Provide two hinges for doors less than **48 inches (1220 mm)** high, and provide three hinges for doors more than **48 inches (1220 mm)** high.
 - 1. Degrees of Opening: **[100][135][170]** degrees.
- D. Wire Pulls: Solid **[nylon][aluminum][stainless steel][or][chrome-plated brass]** wire pulls, fastened from back with two screws.
 - 1. For sliding doors, provide recessed **[stainless steel][or][chrome-plated]** flush pulls.
 - 2. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- E. Semirecessed Pulls: Plastic. For sliding doors, provide recessed plastic flush-pulls. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- F. Door Catches: **[Zinc-plated][Powder-coated]**, **[nylon-roller spring catch][or][dual, self-aligning, permanent magnet catch]**. Provide two catches on doors more than **48 inches (1220 mm)** high.
- G. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.
 - 1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
 - 2. Drawers: Provide one bumper on back side of drawer front at each corner.
- H. Drawer Slides: ANSI/BHMA A156.9.
 - 1. Manufacturer's standard.
 - 2. Standard Duty (Grade 1): **[Side mount][Undermount]**.
 - 3. Heavy Duty (Grade 1HD-100): **[Side mount][Undermount]**.
 - a. Type: **[Full][Full overtravel][Partial]** extension.
 - b. Material: **[Epoxy-coated polymer][Zinc-plated steel]** slides.
 - c. Motion Feature: **[Soft close dampener][Self-closing mechanism]**.
 - 4. General-purpose drawers; provide **[100 lb (45 kg)]<Insert weight>** load capacity.
 - 5. File drawers; provide **[150 lb (45 kg)]<Insert weight>** load capacity.
- I. Label Holders: **[Stainless steel][or][chrome plated]**, sized to receive standard label cards approximately **1 by 2 inches (25 by 51 mm)**, and attached with screws or brads.
 - 1. Provide label holders **[where indicated][on drawers]**.

- J. Drawer and Hinged-Door Locks: **[Cylindrical (cam)][Mortise]** type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.
 - 1. Provide a minimum of two keys per lock and six master keys.
 - 2. Provide locks **[where indicated][on every door and drawer]**.
 - a. Master key for up to **[500]<Insert number>** key changes.
- K. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.
 - 1. Pin-type, **[two-pin-locking plastic shelf rests complying with ANSI/BHMA A156.9, Type B04013][Single-pin metal shelf rests complying with ANSI/BHMA A156.9, Type B04013]**.
 - 2. Mortise-type, **[zinc-plated][powder-coated]** steel standards and shelf rests complying with ANSI/BHMA A156.9, Type B04071 and Type B04091.

2.4 MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.
- B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- D. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- G. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
- H. Softwood Plywood: DOC PS 1.
- I. Particleboard: ANSI A208.1, Grade M-2.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- J. MDF: Medium-density fiberboard, ANSI A208.2, **[Grade 130]<Insert grade>**.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.

- K. Hardboard: ANSI A135.4, Class 1 tempered.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- L. Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABET Inc.]**
 - b. **[Arborite, Division of Wilsonart Canada ULC]**
 - c. **[Formica Corporation]**
 - d. **[Laminart LLC]**
 - e. **[Nevamar Company, LLC]**
 - f. **[Pionite; a Panolam Industries International, Inc. brand]**
 - g. **[Wilsonart LLC]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABET Inc.]**
 - b. **[Arborite, Division of Wilsonart Canada ULC]**
 - c. **[Formica Corporation]**
 - d. **[Laminart LLC]**
 - e. **[Nevamar Company, LLC]**
 - f. **[Pionite; a Panolam Industries International, Inc. brand]**
 - g. **[Wilsonart LLC]**
 - h. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain from single source from single manufacturer.
- M. PVC Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3.0 mm thick at doors and drawer fronts, 1.0 mm thick elsewhere.
- N. Thermally Fused Laminate Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper **[and complying with requirements of ISO 4586]**.
1. Edgebanding for Thermally Fused Laminate (TFL) Panels: PVC or polyester edgebanding matching thermally fused laminate panels.
- O. Glass for Glazed Doors:
1. Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than **[3.0 mm][4.0 mm][5.0 mm][6.0 mm]** thick.
 2. Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
 3. Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.

- P. Frameless Glass Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than **[5.0 mm][6.0 mm]** thick; with exposed edges seamed before tempering.
- Q. Adhesives: Do not use adhesives that contain urea formaldehyde.
- R. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- S. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- T. Adhesives: Do not use adhesives that contain urea formaldehyde.
- U. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

- A. Plastic-Laminate-Clad Cabinet Construction: As required by referenced quality standard, but not less than the following:
 - 1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: **3/4-inch (19-mm)** particleboard.
 - 2. Shelves: **[3/4-inch- (19-mm-) thick particleboard][3/4-inch- (19-mm-) thick plywood or 1-inch- (25-mm-) thick particleboard]**.
 - 3. Backs of Casework: **1/2-inch- (13-mm-) thick particleboard or MDF** where exposed, **[1/4-inch- (6.4-mm-) thick hardboard][1/4-inch- (6.4-mm-) thick, veneer-core hardwood plywood]** dadoed into sides, bottoms, and tops where not exposed.
 - 4. Drawer Fronts: **3/4-inch (19-mm)** particleboard.
 - 5. Drawer Sides and Backs: **1/2-inch- (13-mm-) thick [solid-wood or veneer-core hardwood plywood][particleboard or MDF]**, with glued dovetail or multiple-dowel joints.
 - 6. Drawer Bottoms: **1/4-inch- (6.4-mm-) thick [hardwood plywood][particleboard or MDF]** glued and dadoed into front, back, and sides of drawers. **[Use 1/2-inch (13-mm) material for drawers more than 24 inches (600 mm) wide.]**
 - 7. Drawer Bodies: Steel drawer pans formed from **0.0359-inch- (0.9-mm-) thick metal**, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat and **2 mils (0.05 mm)** for system.
 - 8. Cabinet Doors:
 - a. 48 Inches (1220 mm) High or Less: **3/4 inch (19 mm)** thick, with particleboard or MDF cores **[and solid-wood stiles and rails]**.
 - b. 48 Inches (1220 mm) or More in Height: **[1-1/16 inches (27 mm) thick, with solid hardwood stiles and rails and honeycomb][1-1/8 inches (29 mm) thick, with particleboard]** cores.
 - 9. Stiles and Rails of Glazed Doors:
 - a. 48 Inches (1220 mm) High or Less: **3/4 inch (19 mm)** thick, with particleboard cores.
 - b. 48 Inches (1220 mm) or More in Height: **[1-1/16 inches (27 mm) thick, with solid wood][1-1/8 inches (29 mm) thick, with particleboard]** cores.
- B. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment.

Fabricate from same material and with same finish as casework.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Grade: Install casework to comply with same quality standard grade as item to be installed.
- B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within **1/16 inch (1.5 mm)** of a single plane. Align similar adjoining doors and drawers to a tolerance of **1/16 inch (1.5 mm)**. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within **1/16 inch (1.5 mm)** of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of **1/16 inch (1.5 mm)**.
- E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through **[AWI's Quality Certification Program][WI's Certified Compliance Program]** certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity to prepare and submit report of inspection.

3.4 CLEANING

- A. Repair or remove and replace defective work as directed on completion of installation.



- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 12 30 00 00A

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SECTION 12 30 00 00B - METAL LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal laboratory casework.
2. Auxiliary cabinets.
3. Countertops.
4. Laboratory casework systems.
5. Laboratory accessories.
6. Water and laboratory gas service fittings.
7. Electrical and communication service fittings.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring laboratory casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to laboratory casework.
4. Section 115313 "Laboratory Fume Hoods" for fume hoods[, **including base cabinets and countertops under fume hoods**].

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
- B. Keying Conference: Conduct conference at **[Project site]<Insert location>**. Incorporate keying conference decisions into final keying requirements.

1.3 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
- B. Coordinate installation of laboratory casework with installation of laboratory equipment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 3. Chain-of-Custody Qualification Data: For manufacturer and vendor.

4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
7. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
8. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
9. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
10. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
11. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
12. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
13. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For laboratory casework.

1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations and types of service fittings.
6. Include details of utility spaces showing supports for conduits and piping.
7. Include details of support framing system.
8. Include details of exposed conduits, if required, for service fittings.
9. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and laboratory equipment.
10. Include coordinated dimensions for laboratory equipment specified in other Sections.

D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

E. Samples: For casework finishes and materials requiring color selection.

F. Samples for Initial Selection: For casework finishes and materials requiring color selection.

G. Samples for Verification: For each type of casework, exposed-hardware, and countertop-material finish, in manufacturer's standard sizes.

1. Base Cabinet: One full-size[**16-inch- (406-mm-)**<Insert dimension> wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
2. Wall Cabinet: One full-size[**12-inch- (304-mm-)**<Insert dimension> wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
3. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.

H. Delegated Design Submittals: For laboratory casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports:
 - 1. Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard[**and system structural performance specified in "Performance Requirements" Article**].
 - 2. Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface material with requirements specified for chemical and physical resistance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of casework finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cabinet Mounting Clips and Related Hardware: Quantity equal to **[5]<Insert number>** percent of amount installed, but no fewer than **[20]<Insert number>** of each type.
 - 2. Modular Countertop Units: **[Two]<Insert number>** extra units of each length and material installed.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 M.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet-work are complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where laboratory casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- B. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. System Structural Performance: Laboratory casework and support framing system are to withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
 - 1. Support Framing System: [600 lb/ft. (900 kg/m)]<Insert value>.
 - 2. Suspended Base Cabinets (Internal Load): [160 lb/ft. (240 kg/m)]<Insert value>.
 - 3. Work Surfaces (Including Tops of Suspended Base Cabinets): [160 lb/ft. (240 kg/m)]<Insert value>.
 - 4. Wall Cabinets (Upper Cabinets): [160 lb/ft. (240 kg/m)]<Insert value>.
 - 5. Shelves: [40 lb/sq. ft. (200 kg/sq. m)]<Insert value>.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design laboratory casework installation.
- C. Seismic Performance: Laboratory casework installation is to withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirements>.
 - 1. Design earthquake spectral response acceleration, short period (Sds) for Project is [indicated on Drawings]<Insert requirements>.
 - 2. Component Importance Factor: [1.0][1.5].

3. Base Cabinet Load (Including Countertop and Load on Countertop): [320 lb/ft. (480 kg/m)]<Insert value>.
4. Wall Cabinet (Upper Cabinet) Load: [160 lb/ft. (240 kg/m)]<Insert value>.

2.3 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8 M, "Laboratory Grade Metal Casework."
- B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by [a testing and inspecting agency acceptable to authorities having jurisdiction][FM Approvals].
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 METAL LABORATORY CASEWORK

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
- B. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Bedcolab]
 2. [BMC, Inc.]
 3. [CIF Lab Solutions LP]
 4. [Hamilton Laboratory Solutions, LLC]
 5. [Hanson Lab Solutions]
 6. [ICIScientific]
 7. [Kewaunee Scientific Corporation]
 8. [Lab Crafters, Inc.]
 9. [Mott Manufacturing Ltd]
 10. [Multi-Lab, Inc.]
 11. <Insert manufacturer's name>
- C. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Bedcolab]
 2. [BMC, Inc.]
 3. [CIF Lab Solutions LP]
 4. [Hamilton Laboratory Solutions, LLC]
 5. [Hanson Lab Solutions]
 6. [ICIScientific]
 7. [Kewaunee Scientific Corporation]
 8. [Lab Crafters, Inc.]
 9. [Mott Manufacturing Ltd]
 10. [Multi-Lab, Inc.]
 11. <Insert manufacturer's name>
- D. Nominal Metal Thickness:
 1. Sides, Ends, Fixed Backs, Bottoms, Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch

(1.21 mm). Except for flammable liquid storage cabinets, bottoms may be **0.036 inch (0.91 mm)** if reinforced.

2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: **0.036 inch (0.91 mm)** except **0.048 inch (1.21 mm)** for back panels and doors of flammable liquid storage cabinets and for unreinforced shelves more than **36 inches (900 mm)** long.
3. Intermediate Horizontal Rails, Table Aprons and Cross Rails, Center Posts, and Top Gussets: **0.060 inch (1.52 mm)**.
4. Drawer Runners, Sink Supports, and Hinge Reinforcements: **0.075 inch (1.90 mm)**.
5. Leveling and Corner Gussets: **0.105 inch (2.66 mm)**.

E. Wood Door and Drawer Front Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
3. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
4. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
5. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
6. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
7. Wood Species: [**Red oak**][**White birch**][**Alder**][**White maple**][**Hickory**]<Insert requirements>.
 - a. Wood Stain Colors and Finishes: [**As indicated by manufacturer's designations**][**Match Architect's sample**][**As selected by Architect from casework manufacturer's full range**]<Insert requirements>.
8. Solid Wood: Clear hardwood lumber of species indicated, with moisture content not more than 7 percent.
9. Edgebanding for Wood-Veneered Construction: [**Minimum 1/8-inch- (3-mm-) thick, solid wood of same species as face veneer**][**Wood veneer of same species as face veneer**][**Rigid PVC extrusions, through color with satin finish, 3 mm thick**].
 - a. PVC Colors: [**As indicated by manufacturer's designations**][**Match Architect's samples**][**As selected by Architect from manufacturer's full range**]<Insert requirements>.
10. Composite Wood Products: Products shall be made without urea formaldehyde.
11. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
12. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

13. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
14. Composite Wood Products: Products shall be made without urea formaldehyde.
15. Hardwood Plywood: HPVA HP-1, veneer or particleboard core with face veneer of species indicated. Grade A exposed faces at least **1/50 inch (0.5 mm)** thick, and Grade J crossbands. Provide backs of same species as faces.
16. Particleboard: ANSI A208.1, Grade M-2.
17. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
18. MDF: Medium-density fiberboard, ANSI A208.2, [**Grade 130**]**<Insert grade>**.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
19. Adhesives: Do not use adhesives that contain urea formaldehyde.
20. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
21. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
22. Adhesives: Do not use adhesives that contain urea formaldehyde.
23. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 AUXILIARY CABINETS

- A. Acid Storage-Cabinet Lining: **1/4-inch- (6-mm-)** thick, [**glass-fiber cement board complying with ASTM C1186**][**polyethylene or polypropylene**][**polyethylene, polypropylene, epoxy, or phenolic-composite lining material**].
- B. Float Glass for Glazed Doors: Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than [**3.0 mm**][**4.0 mm**][**5.0 mm**][**6.0 mm**] thick.
- C. Tempered Glass for Glazed Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
- D. Laminated Glass for Glazed Doors: Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- E. Frameless Glass Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than [**5.0 mm**][**6.0 mm**] thick; with exposed edges seamed before tempering.

2.6 CABINET HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

- B. Hinges: **[Stainless][Epoxy-coated-]** steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors **48 inches (1200 mm)** high or less and three for doors more than **48 inches (1200 mm)** high.
- C. Hinged-Door and Drawer Pulls: **[Solid-aluminum, stainless steel, or chrome-plated-brass][Epoxy-coated-steel]**, back-mounted pulls. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
 - 1. Design: **[Wire pulls][Rectangular loop pulls][Rectangular loop pulls with rounded corners][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
 - 2. Overall Size: **[1 by 4-1/2 inches (25 by 114 mm)][1-1/4 by 4-1/2 inches (32 by 114 mm)][1-3/8 by 5-1/2 inches (35 by 140 mm)][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
- D. Sliding-Door Pulls: **[Stainless steel or chrome-plated][Epoxy-coated-steel]** recessed flush pulls.
 - 1. Design and Size: **[Round, 3/4-inch (19-mm) diameter by 1/8 inch (3 mm) deep][Round, 3/4-inch (19-mm) diameter by 3/16 inch (5 mm) deep][Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
- E. Recessed Pulls: **[Aluminum][Polypropylene]**. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- F. Channel Pulls: Full-width, recessed channel pulls; integrally formed from front pan of doors and drawer fronts.
- G. Door Catches: **[Nylon-roller spring][Dual, self-aligning, permanent magnet]** catches. Provide two catches on doors more than **48 inches (1200 mm)** high.
- H. Drawer Slides: ANSI/BHMA A156.9.
 - 1. Manufacturer's standard.
 - 2. Standard Duty (Grade 1): **[Side mount][Undermount]**.
 - 3. Heavy Duty (Grade 1HD-100): **[Side mount][Undermount]**.
 - a. Type: **[Full][Full overtravel][Partial]** extension.
 - b. Material: **[Epoxy-coated polymer][Zinc-plated ball bearing]** slides.
 - c. Motion Feature: **[Soft close dampener][Self-closing mechanism]**.
 - 4. General-purpose drawers; provide **[100 lb (45 kg)]<Insert weight>** load capacity.
 - 5. File drawers; provide **[150 lb (45 kg)]<Insert weight>** load capacity.
- I. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately **1 by 2 inches (25 by 50 mm)**, attached with screws or rivets. Provide **[where indicated][on drawers]**.
- J. Locks: Cam or half-mortise type, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, **[Type E07261]**, Type E07111, or Type E07021.
 - 1. Tumbler: **[Disc][Five pin]**.
 - 2. Lock Locations: Provide **[where indicated][on drawers and doors]<Insert requirements>**.
 - 3. Keying: Key **[locks alike within each room; key each room separately][each lock separately][locks as directed]**.
 - a. Master key for up to **[225][500]<insert number>** key changes.

4. Key Quantity: Minimum of **[two]<Insert number>** keys per lock.
5. Master Key System: Key locks to be operable by master key.

- a. Master Keys: Provide **[two]<Insert number>**.

- K. Sliding-Door Hardware Sets: Laboratory casework manufacturer's standard, to suit type and size of sliding-door units.

2.7 COUNTERTOPS

- A. General: Provide laboratory **[tabletops][and]** countertops with integral **[shelf][trough][and][sink]** as indicated on Drawings.

- B. Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3.

1. Colors, Patterns, and Finishes: **[As indicated by manufacturer's designations][As selected by Architect from casework manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range of solid colors]<Insert requirements>**.

- C. Chemical-Resistant Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3, Grade HGP, and as follows:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Wilsonart LLC]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Wilsonart LLC]**
 - e. **<Insert manufacturer's name>**
 3. Physical Properties: Minimum acceptable chemical-resistance performance is to result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.
 4. Color: **[Black][As indicated by manufacturer's designations][As selected by Architect from chemical-resistant, plastic-laminate manufacturer's full range]<Insert requirements>**.

- D. Core Materials for Plastic Laminate:

1. Certified Wood: Wood products shall be certified as "FSC Pure"[or **"FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
2. Certified Wood: Wood products shall be certified as "FSC Pure"[or **"FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
3. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
4. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
5. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
6. Particleboard: ANSI A208.1, Grade M-2.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
7. Exterior-Glue Particleboard: ANSI A208.1, Grade M-2, Exterior glue.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
8. Exterior Plywood: DOC PS 1, **[Exterior A-C][Exterior B-C]** with fully sanded face.
- E. Adhesive for Bonding Plastic Laminate: **[Type I, waterproof type][Type II water-resistant type]** as selected by fabricator to comply with requirements.
- F. Adhesives: Do not use adhesives that contain urea formaldehyde.
- G. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Adhesives: Do not use adhesives that contain urea formaldehyde.
- J. Adhesives: Do not use adhesives that contain urea formaldehyde.
- K. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Epoxy Scientific LLC]**
 - b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**

- d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Epoxy Scientific LLC]**
 - b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**
 - d. **<Insert manufacturer's name>**
3. Physical Properties:
 - a. Flexural Strength: Not less than **10,000 psi (70 MPa)**.
 - b. Modulus of Elasticity: Not less than **2,000,000 psi (1400 MPa)**.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than **260 deg F (127 deg C)**.
4. Chemical Resistance: Minimum acceptable chemical-resistance performance is to result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.
5. Color: **[Black][Gray][Beige][White][As selected by Architect from epoxy manufacturer's full range]<Insert requirements>**.
- L. Phenolic Composite: Solid, high-pressure decorative laminate, complying with ISO 4586-4, Grade CGS.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Trespa North America]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Trespa North America]**
 - e. **<Insert manufacturer's name>**
 3. Chemical Resistance: Minimum acceptable chemical-resistance performance is to result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.

4. Color: **[Black][Gray][Beige][White][As selected by Architect from phenolic-composite manufacturer's full range]<Insert requirements>**.

M. Stainless Steel Sheet: ASTM A240/A240M, **[Type 304][Type 316L]**.

2.8 METAL CABINET FABRICATION

- A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt- and vermin-resistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of **1/16 to 3/32 inch (1.5 to 2.4 mm)**.
- B. Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.
- C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.
- D. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.
- E. Drawers: Fronts made from outer and inner pans that nest into box formation, without raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. **[Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.]**
- F. Wood Doors: **3/4 inch (19 mm)** thick, with particleboard or MDF cores, **[solid-hardwood stiles and rails,]** and hardwood face veneers and crossbands.
- G. Drawers with Wood Fronts: Fronts made from **3/4-inch- (19-mm-)** thick, hardwood plywood or solid hardwood. Subfronts, sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. **[Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.]**
- H. Design of Wood Doors and Drawer Fronts: **[Lipped overlay with radiused edges][Reveal overlay with square edges][Reveal overlay with radiused edges]**.
 1. Provide **[1/8-inch (3.2-mm)]<Insert dimension>** reveals between adjacent doors and adjacent drawers and between adjacent cabinets.
- I. Veneers for Wood Doors and Drawer Fronts:
 1. Face Veneer Cut: **[Plain sliced][Quarter sliced][Rift cut][Rotary cut]**.
 2. Select and arrange veneers for compatible grain and color; no matching required.
 3. Provide veneers for each cabinet from a single flitch, **[book and running][slip and running][book or slip and running][book and balance][slip and balance][book or slip and balance]** matched.
 - a. Provide continuous matching of adjacent drawer fronts within each cabinet.
 4. Provide veneers for each elevation from a single flitch, **[book and running][slip and**

running][book or slip and running][book and balance][slip and balance][book or slip and balance] matched.

- a. Provide continuous matching of adjacent drawer fronts within each cabinet and end matching between drawer fronts of adjacent cabinets.
5. Grain Direction for Wood Doors and Drawer Fronts: Vertical **[on doors, horizontal on drawer fronts][on both doors and drawer fronts, with continuous vertical matching]**.
- J. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.
- K. Toe Space: Fully enclosed, **4 inches (100 mm)** high by **3 inches (75 mm)** deep, with no open gaps or pockets.
- L. Tables: Welded tubing legs, not less than **2 inches (50 mm)** square with channel stretchers as needed to comply with product standard. Weld or bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device welded to bottom of each leg.
 1. Leg Shoes: **[Black vinyl or rubber][Satin-finished, stainless steel]**, open-bottom, slip-on type.
- M. Utilities: Provide space, cutouts, and holes for pipes, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.
 1. Provide base cabinets with removable backs for access to utility space.
- N. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than **1-5/8 inches (41 mm)** square by **0.105-inch (2.66-mm)** nominal thickness, that are connected at top and bottom by U-shaped brackets made from **1-1/4-by-1/4-inch (32-by-6-mm)** steel flat bars. Framing units may be made by welding channel material into rectangular frames instead of using U-shaped brackets.
- O. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework and with hemmed or flanged edges unless otherwise indicated.
 1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where **[cabinets are not installed against a wall or where space is not otherwise closed][indicated]**. Fabricate from back-to-back panels or of hollow construction to eliminate exposed hemmed or flanged edges.
 2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
 3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.9 LABORATORY CASEWORK SYSTEMS

- A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular cabinets, filler and closure panels, **[wall panels,][undercabinet task-lighting fixtures,]** countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
 1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
 2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
 3. Sinks are supported independent of base cabinets.



4. Support framing has provision for fastening pipe supports at utility space in not more than **1-inch (25-mm)** increments.
5. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate panels from same material and with same finish as metal cabinets and with hemmed or flanged edges.

B. Support Framing: Casework manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:

1. Cabinets, shelves, and countertops are supported from vertical supports[**except where floor-supported base cabinets are indicated**]. Vertical positioning of supported cabinets, shelves, and countertops can be varied in **1-inch (25-mm)** increments through full height of supports.
2. Vertical supports rest on adjustable leveling bases and are secured to floor with metal clips fastened to floor.
3. Vertical supports are installed with braces and rails, connecting them to each other and to permanent building walls to create a stable, rigid structure with framed utility spaces where indicated.

C. Undercabinet Task-Light Luminaires:

1. Lamp Type: **[LED][Single-tube fluorescent fixtures with ballast (sound rating A)]** with switch and heavy-duty cord and plug.
2. Finish: Baked enamel.
3. Diffusers: Virgin acrylic with high resistance to yellowing and other changes from aging, heat, and UV radiation.

D. Countertops: Provide in modular lengths indicated, without seams.

2.10 METAL CABINET FINISH

- A. General: Prepare, treat, and finish welded assemblies after assembling. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply laboratory casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 M. Acceptance level for chemical spot test is to be no more than for Level 3 conditions.
 2. Colors for Metal Laboratory Casework Finish: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.

2.11 WOOD FINISH

- A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least

equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

- B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain to produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
- C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard **[two][three]**-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 M. Acceptance level for chemical spot test is to be no more than for Level 3 conditions.

2.12 COUNTERTOP FABRICATION

- A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of **1 inch (25 mm)**.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - 1. Outlets: Provide with strainers and tailpieces, **NPS 1-1/2 (DN 40)**, unless otherwise indicated.
 - 2. Overflows: **[For each sink except cup sinks,][Where indicated,]** provide overflow of standard beehive or open-top design with separate strainer. Height **2 inches (50 mm)** less than sink depth. Provide in same material as strainer.
- C. Plastic Laminate:
 - 1. Countertops: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to top surface and exposed edges of core with plastic-laminate backing bonded to bottom surface. Sand surfaces to which plastic laminate is to be bonded.
 - a. Top Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)][1-3/16 inches (30 mm)]**.
 - b. Backsplash Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
 - c. Countertop Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - d. Countertop Core for Counters Containing Sinks: **[Exterior-glue particleboard][or][exterior plywood]**.
 - e. Flat Configuration: With square edges, flat backsplashes, and flat end splashes. Finish faces and exposed edges of splashes with same plastic laminate as top.
 - f. Postformed Configuration: With **[raised,]** rolled edge and integral coved backsplash with rolled top edge. Construct top and backsplash from one piece of plastic laminate. Where indicated, provide separate end splashes of same material as top and fitted to top.
 - g. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.
 - 2. Tabletops: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to top surface and exposed edges of core with plastic-laminate backing bonded to bottom surface. Sand surfaces to which plastic laminate is to be bonded.
 - a. Tabletop Core: **[Particleboard][or][exterior plywood]**.
 - b. Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)][1-3/16 inches (30 mm)]**.
 - c. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.

3. Shelves: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to both faces and edges of core. Sand surfaces to which plastic laminate is to be bonded.
 - a. Shelf Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - b. Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
 - c. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.

D. Epoxy:

1. Countertops: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.
 - b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.
 - c. Construction: **[Uniform throughout full thickness][Epoxy composition not less than 1/4 inch (6 mm) thick, laminated to backing]**.
 - d. Product Option: Phenolic-composite countertops may be substituted for epoxy countertops at Contractor's option.
2. Tabletops:
 - a. Flat Configuration: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside at perimeter.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - c. Tabletop Construction: **[Uniform throughout full thickness][Epoxy composition not less than 1/4 inch (6 mm) thick, laminated to backing]**.
 - d. Product Option: Phenolic-composite tabletops may be substituted for epoxy tabletops at Contractor's option.
3. Sinks: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; **1/2-inch (13-mm)** minimum thickness.
 - a. Provide with polypropylene strainers and tailpieces.
 - b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
 - c. Provide sinks for drop-in installation in phenolic-composite countertops with **1/4-inch- (6-mm-)** thick lip around perimeter of sink.
 - d. Provide sinks for underside installation with manufacturer's recommended adjustable

support system for table- and cabinet-type installations.

E. Phenolic Composite:

1. Countertops: Fabricate with cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[1/2-inch (13-mm)][5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with raised edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
2. Tabletops:
 - a. Flat Configuration: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside at perimeter.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
3. Shelves: Flat, **[5/8 inch (16 mm)][3/4 inch (19 mm)]** thick.
 - a. Edges and Corners: **[Beveled][Rounded]**.

F. Stainless Steel:

1. Countertops: Made from stainless steel sheet, not less than **0.062-inch (1.59-mm)** nominal thickness, with No. 4 satin finish.
 - a. Extend top down **1 inch (25 mm)** at edges with a **1/2-inch (13-mm)** return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
 - b. Form backsplash coved to and integral with top surface.
 - c. Provide raised (marine) edge **[around perimeter of countertops containing sinks][and][where indicated]**.
 - d. Pitch countertops that contain sinks two ways to sink[, **where indicated,**] without channeling or grooving.
 - e. Factory punch holes for service fittings.
 - f. Reinforce underside of countertop with channels, or use thicker metal sheet where necessary to ensure rigidity without deflection.
 - g. Weld shop-made joints.
 - h. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
 - i. Where stainless steel sinks and cup sinks occur in stainless steel countertops, factory weld into one integral unit.
 - j. After fabricating and welding, grind surfaces smooth and polish to produce uniform,

directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

2. Shelves: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness, with No. 4 satin finish. Weld shop-made joints. Fold **[down][up]** front edge **3/4 inch (19 mm)**; fold up back edge **3 inches (75 mm)**.
 - a. Provide integral stiffening brackets, formed by folding up ends **3/4 inch (19 mm)** and welding to upturned **[back edge][front and back edges]**.
 - b. After fabricating, grind welds smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
3. Sinks: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Slope sink bottoms to outlet. Provide continuous butt-welded joints.
 - a. Provide double-wall construction for sink partitions with top edge rounded to at least **1/2-inch (13-mm)** diameter.
 - b. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
 - c. Factory punch holes for fittings.
 - d. Provide with stainless steel strainers and tailpieces.
 - e. Provide with integral rims except where located in stainless steel countertops.
 - f. Apply **1/8-inch- (3-mm-)** thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

G. Cup Sinks: Provide in material indicated, **[3-by-6-inch (75-by-150-mm) oval][3-by-9-inch (75-by-228-mm) oval][5-inch (127-mm) diameter][as indicated on Drawings]<Insert requirements>**.

1. Epoxy Cup Sinks: Provide with polypropylene strainers and integral tailpieces.
2. Polypropylene Cup Sinks: Provide with polypropylene strainers and integral tailpieces.
3. Stainless Steel Cup Sinks: Provide with stainless steel strainers and integral tailpieces.

H. Troughs: Provide in material indicated and pitch to drains not less than **1/8 inch/foot (10 mm/m)**. Except where troughs empty into sinks, provide **NPS 1-1/2 (DN 40)** outlets with strainers and tailpieces.

1. Epoxy Troughs: Molded in one piece with smooth surfaces and coved corners; **[1/2-inch (13-mm)][5/8-inch (16-mm)][3/4-inch (19-mm)]** minimum thickness. Provide polypropylene strainers and tailpieces.
2. Stainless Steel Troughs: Made from stainless steel sheet, not less than **[0.050-inch (1.27-mm)][0.062-inch (1.59-mm)]** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean. Provide stainless steel strainers and tailpieces.

2.13 LABORATORY ACCESSORIES

- A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.
- B. Burette Rods: Aluminum or stainless steel rods, **1/2 inch (13 mm)** in diameter and **18 inches (450 mm)**

long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.

- C. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and one horizontal crossbar, **3/4 inch (19 mm)** in diameter and **36 inches (900 mm)** long unless otherwise indicated; two flush socket receptacles and two crossbar clamps. Ends of vertical rods are tapered to fit receptacles; other rod ends are rounded.
- D. Greenlaw Arm Assembly: Aluminum or stainless steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.
- E. Lattice Assembly: Aluminum or stainless steel, vertical and horizontal rod lattice assembly with **3/4-inch- (19-mm-)** diameter rods at approximately **12 inches (300 mm)** o.c. with two flush socket receptacles for mounting.
 - 1. Size: **[36 inches (900 mm)][48 inches (1200 mm)]** wide by **[24 inches (600 mm)][36 inches (900 mm)]** high.
- F. Plastic or Resin Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.
- G. Stainless steel Pegboards: Stainless steel pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.

2.14 WATER AND LABORATORY GAS SERVICE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Broen A/S]**
 - 2. **[Chicago Faucets; Geberit Group]**
 - 3. **[WaterSaver Faucet Co]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Broen A/S]**
 - 2. **[Chicago Faucets; Geberit Group]**
 - 3. **[WaterSaver Faucet Co]**
 - 4. **<Insert manufacturer's name>**
- C. Service Fittings: Provide units that comply with SEFA 7, "Recommended Practices for Fixtures." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
 - 1. Provide units that comply with "Vandal-Resistant Fittings" recommendations in SEFA 7.
- D. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
 - 1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

- E. Finish: **[Chromium plated][Chromium plated unless otherwise indicated][Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes]**.
1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.
- F. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to **80 psig (550 kPa)**.
1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
 2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
 3. Self-Closing Valves: Provide self-closing valves where indicated.
- G. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than **5 lbf (22 N)** to operate. Provide units designed for working pressure up to **75 psig (520 kPa)**, with serrated outlets.
1. Locking Safety Handles: Where ball valves are indicated for fuel-gas use, provide handles that must be **[pushed in][or][pulled up]** before being turned on.
- H. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to **40 psig (280 kPa)**, with serrated outlets.
- I. Steam Valves: Stainless steel seat and PTFE seat disc. Provide units designed for steam working pressure up to **20 psig (140 kPa)**, with serrated outlets.
- J. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
1. Provide units designed for working pressure up to **[60 psig (410 kPa)][100 psig (690 kPa)][125 psig (860 kPa)][as indicated on Drawings][as indicated in schedules]<Insert requirements>**.
- K. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."
- L. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.
- M. Handles: Provide **[three- or four-arm, forged-brass][or][three- or four-wing, molded-plastic or powder-coated-metal]** handles for valves unless otherwise indicated.
1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 3. Provide heat-resistant plastic handles for steam valves.
 4. Provide knurled, molded-plastic handles for needle valves.
- N. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.15 ELECTRICAL AND COMMUNICATION SERVICE FITTINGS

- A. Service Fittings, General: Provide units complete with metal housings, receptacles, switches, pilot lights, **[data communication outlets,]** cover plates, accessories, and gaskets required for mounting on laboratory casework.
- B. Electrical Wiring Devices: Comply with requirements in Section 262726 "Wiring Devices" for receptacles, switches, pilot lights, cover plates, and accessories.
- C. Twisted-Pair Copper Data Outlets: Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- D. Optical-Fiber Data Outlets: Comply with requirements Section 271523 "Communications Optical Fiber Horizontal Cabling."
- E. Receptacles:
 - 1. Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 2. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, and FS W-C-596.
 - 3. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 4. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1310, and FS W-C-596.
 - b. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 - 5. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1310, and FS W-C-596.
 - b. Marking: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
 - 6. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 - 7. Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; **[feed][non-feed]**-through type with integral LED indicator light.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 943 Class A, and FS W-C-596.
 - 8. Hospital-Grade, Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; **[feed][non-feed]**-through type with integral LED indicator light.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 943 Class A, and FS W-C-596.
 - 9. Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with

LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.

a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.

10. Isolated-Ground, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.

a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.

11. Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with integral SPD in line to ground, line to neutral, and neutral to ground.

a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.

12. Isolated-Ground, Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with integral SPD in line to ground, line to neutral, and neutral to ground.

a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.

13. Color of Receptacles: **[Brown][Ivory][As selected by Architect]<Insert color>** unless otherwise indicated or required by NFPA 70.

F. Switches:

1. Single-Pole Switches: 120/277 V, 20 A.

a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

2. Two-Pole Switches: 120/277 V, 20 A.

a. Comply with NEMA WD 1, UL 20, and FS W-S-896.

3. Pilot-Light Switches, Single Pole: 120/277 V, 20 A, with LED-lighted handle, illuminated when switch is off.

a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

4. Key-Operated Switches: 120/277 V, 20 A; single pole, with factory-supplied key in lieu of switch handle.

a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

5. Color of Switches: **[Brown][Ivory][As selected by Architect]<Insert color>** unless otherwise indicated or required by NFPA 70.

- G. Data Communication Outlets: Two RJ-45 jacks for terminating 100-ohm, balanced, four-pair twisted-pair cabling complying with TIA-568-C.1; complying with **[Category 5e][Category 6]<Insert category>**. Comply with UL 1863.

- H. Cover Plates: Provide satin-finish, **[chrome-plated][Type 304, stainless steel]** cover plates with formed, beveled edges.

- I. Cover-Plate Identification: Use **1/4-inch- (6-mm-)** high letters unless otherwise indicated. For stainless steel or chrome-plated metal, stamp or etch plate and fill in letters with black enamel.
 - 1. Provide **[at every cover plate.]****[at the following locations:]**
 - a. Receptacles other than standard 125-V duplex, grounding type.
 - b. Switches and thermal-overload switches.
 - c. Pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Receptacles, switches, and other locations indicated.
 - 2. Provide the following information:
 - a. Voltage and phase for receptacles other than standard 125-V duplex, grounding type.
 - b. Indicate equipment being controlled by switches and thermal-overload switches.
 - c. Indicate equipment being controlled for pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Number of the breaker in panelboard that controls device.
- J. Pedestal-Type Fittings: Cast-aluminum housings with sloped single face or two faces, as indicated, with neoprene gasket under base and with concealed mounting holes in base for attaching to laboratory casework. Provide holes tapped for conduits.
- K. Line-Type Fittings: Provide with cast-metal boxes with threaded holes for mounting on rigid steel conduit. Provide cover plates same size as boxes.
- L. Recessed-Type Fittings: Provide with galvanized-steel boxes.
- M. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Comply with installation requirements in SEFA 2. Install level, plumb, and true in line; shim as required using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: **1/16 inch in 10 feet (1.5 mm in 3 m).**
 - 2. Variation of Bottoms of Upper Cabinets from Level: **1/8 inch in 10 feet (3 mm in 3 m).**
 - 3. Variation of Faces of Casework from a True Plane: **1/8 inch in 10 feet (3 mm in 3 m).**
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): **1/32 inch (0.8 mm).**
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: **1/16 inch (1.5 mm).**

- B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.
- C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than **16 inches (400 mm)** o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than **24 inches (600 mm)** o.c. and at sides of cabinets with not less than two fasteners per side.
- D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than **16 inches (400 mm)** o.c.
- E. Install hardware uniformly and precisely.
- F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Comply with installation requirements in SEFA 2. Abut top and edge surfaces true in plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints where indicated on Shop Drawings.
- B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.
 - 1. Plastic-Laminate Countertops: Secure field-made joints using concealed clamping devices located within **6 inches (150 mm)** of front and back edges and at intervals not exceeding **24 inches (600 mm)**. Tighten in accordance with manufacturer's written instructions to exert a uniform heavy pressure at joints.
- C. Fastening:
 - 1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 - 2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than **48 inches (1200 mm)** o.c.
 - 3. Where necessary to penetrate countertops with fasteners, countersink heads approximately **1/8 inch (3 mm)** and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide holes and cutouts required for service fittings.
- E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
- F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

- G. Dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

- A. Comply with installation requirements in SEFA 2.
- B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
- C. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.
- D. Semiflush Installation of Stainless Steel Sinks: Before setting, apply sink and countertop manufacturers' recommended sealant under rim lip and along top. Remove excess sealant while still wet and finish joint for neat appearance.
- E. Installation of Epoxy and Polypropylene Cup Sinks:
 - 1. Drop-in Installation: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
 - 2. Surface Installation: Set sink in sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

- A. Install accessories in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, stainless steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.
- B. Install fittings in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to

laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Protect countertop surfaces during construction with **6-mil (0.15-mm)** plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of **48 inches (1200 mm)** o.c.

3.8 SERVICE-FITTING SCHEDULE

- A. Water Service Fitting: Type WF-[#].
 - 1. Fitting Type: [**Swing-spout mixing faucet**][Rigid, gooseneck mixing faucet][Rigid, gooseneck, single-service faucet][Remote-control, rigid, gooseneck, single-service faucet][Single-service hose bib].
 - 2. Outlet: [**Aerator**][Vacuum breaker and removable serrated outlet].
 - 3. Mounting: [**Wall**][Deck][Line] mounted.
 - 4. Additional Requirements: [**Self-closing valves**][For reagent-grade water]<Insert requirement>.
- B. Laboratory Steam Service Fitting: Type SF-[#].
 - 1. Fitting Type: [**Turret**][Line mounted][Flange type][Remote-control turret][Remote-control flange type].
 - 2. Outlets: [**One**][Two, at 90 degrees][Two, at 180 degrees][Three][Four].
 - 3. Outlet Type: [**Straight**][Angled].
- C. Laboratory Gas Service Fitting: Type GF-[#].
 - 1. Service: [**Air**][Gas (fuel gas)][Vacuum]<Insert service>.
 - 2. Fitting Type: [**Turret**][Line mounted][Flange type][Remote-control turret][Remote-control flange type].
 - 3. Outlets: [**One**][Two, at 90 degrees][Two, at 180 degrees][Three][Four].
 - 4. Outlet Type: [**Straight**][Angled].
 - 5. Valve Type: [**Ground-key cock**][Ball valve][Needle valve].
- D. Electrical Service Fitting: Type EF-[#].
 - 1. Fitting Type: [**Pedestal, single faced**][Pedestal, double faced][Recessed][Line mounted].
 - 2. Device: [**One duplex receptacle**][Two duplex receptacles][Four duplex receptacles][One switched receptacle][One duplex receptacle, switch, and pilot light].
 - 3. Additional Requirements: [**GFCI**][SPD] receptacles.
- E. Communication Service Fitting: Type CF-[#].
 - 1. Fitting Type: [**Pedestal, single faced**][Pedestal, double faced][Recessed][Line mounted].
 - 2. Device: [**One duplex communication receptacle**][Two duplex receptacles].
- F. Electrical and Communication Service Fitting: Type ECF-[#].

1. Fitting Type: [**Pedestal, single faced**][**Pedestal, double faced**][**Recessed**][**Line mounted**].
2. Device: [**One duplex receptacle and one duplex communication receptacle**][**Two duplex receptacles and two duplex communication receptacles**][**One switched receptacle and one duplex communication receptacle**].
3. Additional Requirements: [**GFCI**][**SPD**] receptacles.

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Task	Specification	Specification Description
12 30 00 00	12 35 70 00	Healthcare Casework
12 31 00 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 31 00 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 31 00 00	12 30 00 00b	Metal Laboratory Casework
12 31 00 00	12 35 70 00	Healthcare Casework



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SECTION 12 31 16 00 - STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Granite countertops.
2. Marble countertops.
3. Slate countertops.
4. Accessories.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for cantilever supports.
2. Section 123661 "Simulated Stone Countertops" for cultured-marble and quartz-agglomerate countertops.
3. Section 224100 "Residential Plumbing Fixtures" for non-integral sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each[**variety of stone,**] and stone accessory product.

B. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachments to other work.
2. Locations and details of joints.
3. Direction of veining, grain, or other directional pattern.
4. Locations and sizes of cutouts and holes for items installed in countertop.
5. Apply **[AWI's Quality Certification][WI's Certified Compliance]** Program label to Shop Drawings.

C. Samples: For each stone type, in sets not less than **12 inches (300 mm)** square.

1. Include **[two][three]** or more Samples in each set and show the full range of variations in appearance characteristics expected in the completed Work.

D. Sustainable Design Submittals:

1. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
2. Environmental Product Declaration (EPD): For each product.
3. Health Product Declaration (HPD): For each product.
4. Environmental Product Declaration (EPD): For each product.
5. Health Product Declaration (HPD): For each product.
6. Environmental Product Declaration (EPD): For each product.
7. Environmental Product Declaration (EPD): For each product.

8. Environmental Product Declaration (EPD): For each product.
9. Third-Party Certifications: For each product.
10. Third-Party-Certified Life-Cycle Assessment: For each product.
11. Product Data: For installation adhesives, indicating VOC content.
12. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
13. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertop and backsplashes.
- B. Quality Standard Compliance Certificates: **[AWI's Quality Certification Program][WI's Certified Compliance Program]**.
- C. Qualification Statements: For fabricator.
- D. Material Test Reports:
 1. Stone Test Reports: For **[each]** stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, in accordance with referenced ASTM standards. Base reports on testing done within previous **[three][five]<Insert number>** years.
 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone countertops. Include product data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
 1. Shop Certification: **[AWI's Quality Certification Program accredited participant][WI's Certified Compliance Program licensee]**.
- B. Installer Qualifications: Fabricator of stone countertops.

1.6 MOCKUPS

- A. Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup [**as indicated on Drawings**]**<Insert mockup requirements>**.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturer, for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication[**and indicate measurements on Shop Drawings**].

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Stone: Obtain[**each variety of**] stone,[**regardless of finish,**] from a single quarry[, **whether specified in this Section or in another Specification Section,**] with resources to provide materials of consistent quality in appearance and physical properties.
 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 2. Make stone slabs available for examination by Architect.
 - a. Architect will select aesthetically acceptable slabs[**and will indicate aesthetically unacceptable portions of slabs**].
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.
 - c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Comply with recommendations in NSI's "Dimension Stone Design Manual."

- B. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that may impair structural integrity, function, or appearance.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- C. Quality Standard: Unless otherwise indicated, comply with **[ANSI/AWI 1236][NAAWS]** for grades of stone countertops indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from **[AWI][WI]** certification program indicating that countertops comply with requirements of grade specified.
 - 2. The Contract Documents contain requirements that are more stringent than that of the referenced quality standard. Comply with requirements of the Contract Documents in addition to those of referenced quality standard.
 - 3. Grade: **[Premium][Custom][Economy][Match related casework]**.

2.3 GRANITE COUNTERTOPS

- A. Material Standard: Comply with ASTM C615/C615M.
- B. Regional Materials: Verify cast stone units are manufactured within **100 miles (160 km)** of Project site from aggregates **[and cement]** that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- C. Regional Materials: Verify cast stone units are manufactured within **500 miles (800 km)** of Project site from aggregates **[and cement]** that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
- D. Granite Countertop Type :
 - 1. Characteristics: Uniform, **[fine][medium]**-grained, **[white][pink][gray][black]<Insert color>** stone **[without veining]**.
 - 2. Varieties and Sources: Subject to compliance with requirements, **[provide the following][provide one of the following][available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>**.
 - b. Cut: **[Vein][Fleuri]**.
 - 1) Cut stone from contiguous, matched slabs in which natural markings occur.
 - c. Finish: **[Polished][Honed][Brushed][As indicated][Match Architect's sample]<Insert finish>**.
 - d. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - 3. Description:
 - a. Nominal Thickness: Provide thickness indicated, but not less than **[3/4 inch (20 mm)][7/8 inch (22 mm)][1-1/4 inches (32 mm)]**. Gage backs to provide units of identical thickness.

- b. Edge Profile: **[Straight, slightly eased at top][Bevel][Full bullnose][3/8-inch (10-mm) radius with 2-inch (50-mm) apron][As indicated]<Insert profile>**.
- c. Splashes: Provide **3/4-inch- (20-mm-)** thick **[backsplashes][and][end splashes]** unless otherwise indicated.
 - 1) Height: **[4 inches (100 mm)][As indicated]<Insert dimension>**.
 - 2) Top-Edge Profile: **[Straight][Bevel][Radius][Match countertop edge][As indicated]<Insert profile>**.
- 4. Sink Bowls:
 - a. **[Top Mount][Undermount]**, with minimum **3/4-inch (19-mm)** wall thickness, complying with CSA B45.5/IAPMO Z124.
 - b. **[Oval][Rectangle][As selected by Architect from manufacturer's full range]**.

2.4 MARBLE COUNTERTOPS

- A. Material Standard: Comply with ASTM C503/C503M[, **Classification I Calcite**], **Classification II Dolomite**], **Group A**], **Group B**], **Group C**], **Group D**].
 - 1. Stone Abrasion Resistance: Minimum value of **[10]<Insert value>**, based on testing in accordance with ASTM C241/C241M or ASTM C1353/C1353M.
 - 2. Regional Materials: Verify stone is fabricated within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered within **100 miles (160 km)** of Project site.
 - 3. Regional Materials: Verify stone is fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
- B. Marble Countertop Type :
 - 1. Characteristics: Uniform, fine- to medium-grained, **[white]<Insert color>** stone with only slight veining.
 - 2. Varieties and Sources: Subject to compliance with requirements, **[provide the following][provide one of the following][available stone varieties that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>**.
 - b. Cut: **[Vein][Fleuri]**.
 - 1) Cut stone from contiguous, matched slabs in which natural markings occur.
 - c. Finish: **[Polished][Honed][Brushed][As indicated][Match Architect's sample]<Insert finish>**.
 - d. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - 3. Description:
 - a. Nominal Thickness: Provide thickness indicated, but not less than **[3/4 inch (20 mm)][7/8 inch (22 mm)][1-1/4 inches (32 mm)]**. Gage backs to provide units of identical thickness.
 - b. Edge Detail: **[Straight, slightly eased at top][Bevel][Full bullnose][3/8-inch (10-mm)**

- radius with 2-inch (50-mm) apron][As indicated]<Insert profile>.
 - c. Splashes: Provide 3/4-inch- (20-mm-) thick [backsplashes][and][end splashes] unless otherwise indicated.
 - 1) Height: [4 inches (100 mm)][As indicated]<Insert dimension>.
 - 2) Top-Edge Profile: [Straight][Bevel][Radius][Match countertop edge][As indicated]<Insert profile>.
- 4. Sink Bowls:
 - a. [Top Mount][Undermount], with minimum 3/4-inch (19-mm) wall thickness, complying with CSA B45.5/IAPMO Z124.
 - b. [Oval][Rectangle][As selected by Architect from manufacturer's full range].

2.5 SLATE COUNTERTOPS

- A. Material Standard: Comply with ASTM C629/C629M[, **Classification I Exterior**][, **Classification II Interior**].
 - 1. Stone Abrasion Resistance: Minimum value of [8]<Insert value>, based on testing in accordance with ASTM C241/C241M or ASTM C1353/C1353M.
 - 2. Regional Materials: Verify stone is fabricated within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered within **100 miles (160 km)** of Project site.
 - 3. Regional Materials: Verify stone is fabricated within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered within **500 miles (800 km)** of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
- B. Slate Countertop Type :
 - 1. Characteristics: [Black][Blue-black][Gray][Blue-gray][Green][Purple][Mottled purple and green][Red] slate with a fine, even grain[and unfading color,] from clear, sound stock.
 - 2. Varieties and Sources: Subject to compliance with requirements, [provide the following][provide one of the following][available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.
 - b. Finish: [Honed][Sand Rubbed][Tumbled][As indicated][Match Architect's sample]<Insert finish>.
 - c. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - 3. Description:
 - a. Nominal Thickness: Provide thickness indicated, but not less than [1 inch (25 mm)][1-1/4 inches (30 mm)]. Gage backs to provide units of identical thickness.
 - b. Edge Profile: [Straight, slightly eased at top and bottom][Bevel][Full bullnose][As indicated]<Insert profile>.
 - c. Splashes: Provide 3/4-inch- (20-mm-) thick [backsplashes][and][end splashes] unless otherwise indicated.
 - 1) Height: [4 inches (100 mm)][As indicated]<Insert dimension>.

- 2) Top-Edge Profile: **[Straight, slightly eased at top and bottom][Bevel][Radius][As indicated]<Insert profile>.**

4. Sink Bowls:

- a. **[Top Mount][Undermount]**, with minimum **3/4-inch (19-mm)** wall thickness, complying with CSA B45.5/IAPMO Z124.
- b. **[Oval][Rectangle][As selected by Architect from manufacturer's full range].**

2.6 ACCESSORIES

A. Grommets:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[Doug Mockett & Company, Inc.]**
- b. **[Hafele America Co.]**
- c. **[W.W. Grainger, Inc.]**
- d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Doug Mockett & Company, Inc.]**
- b. **[Hafele America Co.]**
- c. **[W.W. Grainger, Inc.]**
- d. **<Insert manufacturer's name>**
3. Wire-Management Grommets: Circular, grommets and matching caps with slot for wire passage.
- a. Finish: **[Metal][Molded plastic].**
- b. Outside Diameter: **[1-1/4 inches (32 mm)][2 inches (51 mm)]<Insert dimension>.**
- c. Color: **[Brushed, nickel plated][Polished, chrome plated][Black, epoxy coated][Brown][Black]<Insert finish>.**
4. Power/Data Grommets: UL-listed **[recessed][pop-up]** grommet.
- a. Power Outlets: **[Two][Three][Five].**
- b. USB Charger: **[Type A][Type B][1 Dual]<Insert type>.**
5. Paper-Slot Grommet: **[12 inches (305 mm)][17 inches (432 mm)]** long by **1-3/4 inches (45 mm)** wide by **1 inch (25 mm)** deep; molded-plastic, paper-slot liner with **1/4-inch (6.4-mm)** lip.
- a. Color: **[Brown][Black]<Insert color>.**

B. Support Brackets:

1. Countertop: **<Insert type or drawing designation>:**
- a. Type: **[Hidden][Front mount][Decorative].**

- b. Style: <Insert manufacturer and model number>.
- c. Material: [Steel][Stainless steel][Bronze][Iron].
- d. Color: [Black][White] powder coat.

2.7 MISCELLANEOUS MATERIALS

- A. General: Use only adhesives formulated for stone and ceramic tile and that are recommended by their manufacturer for the application indicated.
 - 1. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 2. Product Data: For installation adhesives, indicating VOC content.
 - 3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
- B. Subtops:
 - 1. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - a. Verify particleboard is made without urea formaldehyde.
 - b. Verify particleboard has formaldehyde emission rates not greater than 0.09 ppm when tested in accordance with ASTM D6007 or ASTM E1333.
 - 2. Plywood: [Marine Grade][Exterior Grade C-D Exposure 1] complying with DOC PS 1.
- C. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Atlas Minerals & Chemicals, Inc]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Jamo Inc]
 - h. [Laticrete International, Inc.]
 - i. [MAPEI Corporation]
 - j. [Parex, a Sika brand]
 - k. [Sakrete; CRH Americas, Oldcastle APG]
 - l. [Southern Grouts & Mortars, Inc]
 - m. [Summitville Tiles, Inc.]
 - n. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARDEX Americas]
 - b. [Atlas Minerals & Chemicals, Inc]

- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Jamo Inc]
- h. [Laticrete International, Inc.]
- i. [MAPEI Corporation]
- j. [Parex, a Sika brand]
- k. [Sakrete; CRH Americas, Oldcastle APG]
- l. [Southern Grouts & Mortars, Inc]
- m. [Summitville Tiles, Inc.]
- n. <Insert manufacturer's name>

D. Water-Cleanable Epoxy Grout: ANSI A118.3,[with a VOC content of 65 g/L or less].

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Atlas Minerals & Chemicals, Inc]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Jamo Inc]
- h. [Laticrete International, Inc.]
- i. [MAPEI Corporation]
- j. [Parex, a Sika brand]
- k. [Sakrete; CRH Americas, Oldcastle APG]
- l. [Sauereisen]
- m. [Siena Tile & Stone Installation Products; Omega Products International]
- n. [Southern Grouts & Mortars, Inc]
- o. [Summitville Tiles, Inc.]
- p. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Atlas Minerals & Chemicals, Inc]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Jamo Inc]
- h. [Laticrete International, Inc.]
- i. [MAPEI Corporation]
- j. [Parex, a Sika brand]
- k. [Sakrete; CRH Americas, Oldcastle APG]
- l. [Sauereisen]
- m. [Siena Tile & Stone Installation Products; Omega Products International]
- n. [Southern Grouts & Mortars, Inc]
- o. [Summitville Tiles, Inc.]

p. <Insert manufacturer's name>

- E. Stone Adhesive: [**Epoxy**][or][**polyester**] formulated specifically for bonding or seaming stone to stone, with an initial set time of not more than two hours at **70 deg F (21 deg C)**.
 - 1. Color: [**Clear**][**Match stone**].
- F. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and that will not stain the stone it is applied to.
 - 1. Mildew-Resistant Joint Sealant: [**Mildew resistant, single component, nonsag, neutral curing, silicone**][**Single component, nonsag, mildew resistant, acid curing, silicone**]<Insert joint sealant>.
 - 2. Joint Sealant: [**Latex**][**Single component, nonsag, neutral curing, silicone; Class 25**]<Insert joint sealant>.
 - 3. Color: [**Clear**][**As selected by Architect from manufacturer's full range**].
- G. Stone Joint Splines: Stainless steel or brass washers approximately **1 inch (25 mm)** in diameter and of thickness to fit snugly in saw-cut kerf in edge of stone units.
- H. Stone Cleaner: Specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer[**and, if a sealer is specified, by sealer manufacturer**]. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- I. Stone Sealer: Stone manufacturer's recommended colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.8 FABRICATION

- A. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
 - 1. Clean sawed backs of stones to remove rust stains and iron particles.
 - 2. Dress joints straight and at right angle to face unless otherwise indicated.
 - 3. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
 - 4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 - 5. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snapping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased unless otherwise indicated.
 - 6. Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.
- B. Mark stone for final locations to produce assembled countertop units with an overall uniform appearance.
- C. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
- D. Joints:
 - 1. Fabricate countertops without joints.

2. Fabricate countertops in sections for joining in field[, **with joints at locations indicated**].
3. Joint Locations: Not within **18 inches (450 mm)** of a sink or cooktop and not where a countertop section less than **36 inches (900 mm)** long may result, unless unavoidable.
4. Joint Type, Bonded or Seamed: **1/32 inch (0.8 mm)** or less in width.
5. Joint Type, Grouted: **1/16 inch (1.5 mm)** in width.
6. Joint Type, Sealant Filled: **1/16 inch (1.5 mm)** in width.
7. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints[**where indicated**]. Make width of cuts slightly more than thickness of splines to provide snug fit.[**Provide at least three splines in each joint.**]

E. Cutouts and Holes:

1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting **3/16 inch (5 mm)** into fixture opening.
 - b. Provide vertical edges, rounded to **3/8-inch (10-mm)** radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting **3/16 inch (5 mm)** into fixture opening.
 - c. Provide **3/4-inch (20-mm)** full bullnose edges projecting **3/8 inch (10 mm)** into fixture opening.
2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by stone countertop Installer for anchoring stone countertops. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives, and rinse with clear water. Allow stone to dry before installing.

3.3 INSTALLATION OF STONE COUNTERTOPS

- A. Grade: Install countertop to comply with same grade as item to be installed.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Install countertops over subtops with full spread of water-cleanable epoxy adhesive.
- D. Install countertops by adhering to supports with water-cleanable epoxy adhesive.
- E. Do not field cut stone unless otherwise indicated. If stone countertops or splashes require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.
- F. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight, true, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- G. Set stone to comply with requirements indicated. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. **[Install anchors and other attachments indicated or necessary to secure stone countertops in place.]**
- H. Bond joints with stone adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in stone edges at joints **[where indicated]**. Fill kerfs with stone adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- I. Space joints with **1/16-inch (1.5-mm)** gap for filling with **[grout][sealant]**. Use temporary shims to ensure uniform spacing.
 - 1. Install metal splines in kerfs in stone edges at joints **[where indicated]**. Fill kerfs with **[setting adhesive][sealant]** before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- J. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- K. Install backsplashes and end splashes by adhering to countertops with stone adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Leave **1/16-inch (1.5-mm)** gap between splashes and wall for filling with sealant. Use temporary shims to ensure uniform spacing.
- L. Install backsplashes and end splashes by adhering to wall with water-cleanable epoxy adhesive. Leave **1/16-inch (1.5-mm)** gap between countertop and splashes for filling with sealant. Use temporary shims to ensure uniform spacing.
- M. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout

uniformly and smoothly with plastic tool.

- N. Apply sealant to **[joints][and][gaps specified for filling with sealant]**; comply with Section 079200 "Joint Sealants." Remove temporary shims before applying sealant.

3.4 REPAIR

- A. Repair damaged and defective countertop where possible, to eliminate functional and visual defects **and to result in interior architectural woodwork being in compliance with requirements of referenced quality standard for the specified grade**.
- B. Where not possible to repair, remove and replace stone countertops of the following description:
1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 2. Defective countertops.
 3. Defective joints, including misaligned joints.
 4. Interior stone countertops and joints not matching approved Samples and mockups.
 5. Interior stone countertops not complying with other requirements indicated.
- C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

3.5 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through **[AWI's Quality Certification Program][WI's Certified Compliance Program]** certifying that woodwork, including installation, complies with requirements of the referenced standard for the specified grade.
1. Inspection entity is to prepare and submit report of inspection.

3.6 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Clean stone countertops no fewer than six days after completion of **[sealant installation][installation]**, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that may damage stone.
- C. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION 12 31 16 00



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Task	Specification	Specification Description
12 31 16 00	01 11 19 00	No Specification Required
12 31 16 00	06 40 00 00a	Interior Architectural Woodwork
12 31 16 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 31 16 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 31 16 00	12 30 00 00b	Metal Laboratory Casework
12 31 16 00	12 35 70 00	Healthcare Casework



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SECTION 12 35 00 00 - PLASTIC-LAMINATE-CLAD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad laboratory casework.
2. Auxiliary cabinets.
3. Countertops.
4. Laboratory accessories.
5. Water and laboratory gas service fittings.
6. Electrical and communication service fittings.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring laboratory casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to laboratory casework.
4. Section 115313 "Laboratory Fume Hoods" for fume hoods[, **including base cabinets and countertops under fume hoods**].

1.2 DEFINITIONS

- A. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.
- B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than **48 inches (1200 mm)** above floor, and visible surfaces in open cabinets or behind glass doors.
1. Ends of cabinets are defined as "exposed"[**except ends are defined as "concealed" where installed directly against and completely concealed by walls or other cabinets**].
- C. Plastic Laminate: High-Pressure Decorative Laminate (HPDL).
- D. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases **78 inches (1980 mm)** or more above floor and bottoms of cabinets more than **24 inches (600 mm)**, but less than **48 inches (1200 mm)** above floor, are defined as "semiexposed."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
- B. Keying Conference: Conduct conference at **[Project site]<Insert location>**. Incorporate keying conference decisions into final keying requirements.

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
- B. Coordinate installation of laboratory casework with installation of laboratory equipment.

1.5 ACTION SUBMITTALS

A. Product Data:

- 1. Plastic-laminate-clad laboratory casework.
- 2. Auxiliary cabinets.
- 3. Countertops.
- 4. Laboratory accessories.
- 5. Water and laboratory gas service fittings.
- 6. Electrical and communication service fittings.

B. Sustainable Design Submittals:

- 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- 3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- 4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- 6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- 7. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 8. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 9. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 10. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 11. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 12. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
- 13. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For laboratory casework.

- 1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
- 2. Indicate types and sizes of casework.
- 3. Indicate manufacturer's catalog numbers for casework.
- 4. Show fabrication details, including types and locations of hardware.
- 5. Indicate locations and types of service fittings.
- 6. Include details of utility spaces showing supports for conduits and piping.
- 7. Include details of exposed conduits, if required, for service fittings.
- 8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and laboratory equipment.
- 9. Include coordinated dimensions for laboratory equipment specified in other Sections.

- D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- E. Samples: For plastic laminate.
- F. Samples for Initial Selection: For plastic laminate and other materials requiring color selection.
- G. Samples for Verification: For each type of casework, exposed-hardware, and countertop-material finish, in manufacturer's standard sizes.
 - 1. Base Cabinet: One full-size[, **16-inch- (406-mm-)]<Insert dimension>** wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
 - 2. Wall Cabinet: One full-size[, **12-inch- (304-mm-)]<Insert dimension>** wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 - 3. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.
- H. Delegated Design Submittals: For laboratory casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports: For countertop surface material, based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface material with requirements specified for chemical and physical resistance.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet-work are complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where laboratory casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- B. Obtain **[countertops][sinks][accessories][and][service fittings]** from casework manufacturer.
- C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design laboratory casework installation.
- B. Seismic Performance: Laboratory casework installation to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirements>**.
 - 1. Design earthquake spectral response acceleration, short period (Sds) for Project is **[indicated on Drawings]<Insert requirements>**.
 - 2. Component Importance Factor: **[1.0][1.5]**.
 - 3. Base Cabinet Load (Including Countertop and Load on Countertop): **[200 lb/ft. (300 kg/m)]<Insert value>**.
 - 4. Wall Cabinet (Upper Cabinet) Load: **[100 lb/ft. (150 kg/m)]<Insert value>**.

2.3 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8-PL, "Laboratory Grade Plastic Laminate Casework."

- B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by **[a testing and inspecting agency acceptable to authorities having jurisdiction][FM Approvals]**.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- E. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site.
- F. Regional Materials: Wood products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- G. Indigenous Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- I. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
- J. Certified Wood: Wood products shall be certified as "FSC Pure"[**or "FSC Mixed Credit"**] according to FSC STD-01-001 and FSC STD-40-004.
- K. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- L. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- M. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

2.4 PLASTIC-LAMINATE-CLAD LABORATORY CASEWORK

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Case Systems Inc]**
 - 2. **[CIF Lab Solutions LP]**

3. [Stevens Industries, Inc.]
4. [TMI Systems Corporation]
5. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Case Systems Inc]
2. [CIF Lab Solutions LP]
3. [Stevens Industries, Inc.]
4. [TMI Systems Corporation]
5. <Insert manufacturer's name>

C. Design:

1. Lipped overlay with radiused wood edges[**and full-width, recessed finger pulls machined into faces of doors and drawers**].
2. Reveal overlay[**with recessed finger pulls machined into faces of doors and drawers**].
3. Flush overlay.

D. Grain Direction for Wood Grain Plastic Laminate:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: [**Vertical with continuous vertical matching**][Horizontal].
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

E. Exposed Materials:

1. Plastic-Laminate Grade: [HGS][VGS].
 - a. Colors and Patterns: [**As indicated by manufacturer's designations**][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>.
2. Edgebanding: [**Plastic laminate matching adjacent surfaces**][PVC].
 - a. PVC Edgebanding Color: [**Casework manufacturer's standard**][As selected by Architect from casework manufacturer's full range]<Insert requirements>.
3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
 - a. Wood Species: [**Red oak**][White birch][Alder][White maple][Hickory][Cherry]<Insert species>.
 - b. Wood Finish: [**As indicated by manufacturer's designations**][Match Architect's sample][As selected by Architect from casework manufacturer's full range]<Insert requirements>.

F. Semiexposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.

- a. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.
 - b. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
2. Thermally Fused Laminate (TFL) Panels: Provide thermally fused laminate (TFL) panels for semiexposed surfaces unless otherwise indicated.
 - a. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]<Insert requirements>**.
 - b. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
 3. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects.
 4. Plywood: Hardwood plywood. **[Grade B][Grade C]** faces and Grade J crossbands. Provide backs of same species as faces.
 5. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

G. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood.
3. Plastic Laminate: Grade VGS.
4. Particleboard.
5. MDF.
6. Hardboard.

2.5 PLASTIC-LAMINATE CABINET MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.
- B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- D. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

- G. MDF: Medium-density fiberboard, ANSI A208.2, [**Grade 130**]**<Insert grade>**.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- H. Particleboard: ANSI A208.1, Grade M-2.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- I. Hardboard: ANSI A135.4, Class 1 tempered.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
- J. Plastic Laminate: HDPL complying with ISO 4586-3.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABET Inc.]**
 - b. **[Arborite, Division of Wilsonart Canada ULC]**
 - c. **[Formica Corporation]**
 - d. **[Laminart LLC]**
 - e. **[Nevamar Company, LLC]**
 - f. **[Wilsonart LLC]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABET Inc.]**
 - b. **[Arborite, Division of Wilsonart Canada ULC]**
 - c. **[Formica Corporation]**
 - d. **[Laminart LLC]**
 - e. **[Nevamar Company, LLC]**
 - f. **[Wilsonart LLC]**
 - g. **<Insert manufacturer's name>**
- K. PVC Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3.0 mm thick at doors and drawer fronts, 1.0 mm thick elsewhere.
- L. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.
1. Edgebanding for Thermally Fused Laminate (TFL) Panels: PVC or polyester edgebanding matching thermally fused laminate panels.
- M. Adhesives: Do not use adhesives that contain urea formaldehyde.
- N. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical

Emissions from Indoor Sources Using Environmental Chambers."

- O. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- P. Adhesives: Do not use adhesives that contain urea formaldehyde.
- Q. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.6 AUXILIARY CABINETS

- A. Acid Storage-Cabinet Lining: **1/4-inch- (6-mm-)** thick, **[glass-fiber cement board complying with ASTM C1186][polyethylene or polypropylene][polyethylene, polypropylene, epoxy, or phenolic-composite lining material]**.
- B. Float Glass for Glazed Doors: Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than **[3.0 mm][4.0 mm][5.0 mm][6.0 mm]** thick.
- C. Tempered Glass for Glazed Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
- D. Laminated Glass for Glazed Doors: Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- E. Frameless Glass Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than **[5.0 mm][6.0 mm]** thick; with exposed edges seamed before tempering.

2.7 CABINET HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Butt Hinges: **[Stainless][Epoxy-coated]** steel, five-knuckle hinges complying with ANSI/BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors **48 inches (1200 mm)** high or less and three for doors more than **48 inches (1200 mm)** high.
- C. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, Type B01602, **self-closing**. Provide two for doors **48 inches (1200 mm)** high or less and three for doors more than **48 inches (1200 mm)** high.
 - 1. Degrees of Opening: **[100][135][170]**.
- D. Hinged-Door and Drawer Pulls: **[Solid-aluminum, stainless steel, or chrome-plated-brass][Epoxy-coated-steel]**, back-mounted pulls. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
 - 1. Design: **[Wire pulls][Rectangular loop pulls][Rectangular loop pulls with rounded corners][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
 - 2. Overall Size: **[1 by 4-1/2 inches (25 by 114 mm)][1-1/4 by 4-1/2 inches (32 by 114 mm)][1-3/8 by 5-1/2 inches (35 by 140 mm)][As indicated]<Insert requirements>**.

- E. Sliding-Door Pulls: **[Stainless steel or chrome-plated][Epoxy-coated-steel]** recessed flush pulls.
 - 1. Design and Size: **[Round, 3/4-inch (19-mm) diameter by 1/8 inch (3 mm) deep][Round, 3/4-inch (19-mm) diameter by 3/16 inch (5 mm) deep][Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep][As selected from manufacturer's full range][As indicated]<Insert requirements>.**
- F. Recessed Pulls: **[Aluminum][Polypropylene]**. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- G. Channel Pulls: Full-width, recessed **[aluminum][solid-hardwood]** pulls.
- H. Door Catches: **[Nylon-roller spring][Dual, self-aligning, permanent magnet]** catches. Provide two catches on doors more than **48 inches (1200 mm)** high.
- I. Drawer Slides: ANSI/BHMA A156.9.
 - 1. Manufacturer's standard.
 - 2. Standard Duty (Grade 1): **[Side mount][Undermount]**.
 - 3. Heavy Duty (Grade 1HD-100): **[Side mount][Undermount]**.
 - a. Type: **[Full][Full overtravel][Partial]** extension.
 - b. Material: **[Epoxy-coated polymer][Zinc-plated ball bearing]** slides.
 - c. Motion Feature: **[Soft close dampener][Self-closing mechanism]**.
 - 4. General-purpose drawers; provide **[100 lb (45 kg)]<Insert weight>** load capacity.
 - 5. File drawers; provide **[150 lb (45 kg)]<Insert weight>** load capacity.
- J. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately **1 by 2 inches (25 by 50 mm)**, attached with screws or rivets. Provide **[where indicated][on drawers]**.
- K. Locks: Cam type, brass with chrome-plated finish; complying with ANSI/BHMA A156.11, Type E07281 **[or Type E07261]**.
 - 1. Tumbler: **[Disc][Five pin]**.
 - 2. Lock Locations: Provide **[where indicated][on drawers and doors]<Insert requirements>.**
 - 3. Keying: Key **[locks alike within each room; key each room separately][each lock separately][locks as directed]**.
 - a. Master key for up to **[225][500]<Insert number>** key changes.
 - 4. Key Quantity: Minimum of **[two]<Insert number>** keys per lock.
 - 5. Master Key System: Key locks to be operable by master key.
 - a. Master Keys: Provide **[two]<Insert number>.**
- L. Sliding-Door Hardware Sets: Laboratory casework manufacturer's standard, to suit type and size of sliding-door units.
- M. Adjustable Shelf Supports: ANSI/BHMA A156.9, powder-coated steel **[shelf rests, Type B04013][standards, mortise type, and shelf rests, Type B04071 and Type B04091]**.

2.8 COUNTERTOPS

- A. General: Provide laboratory **[tabletops][and]** countertops with integral **[shelf][trough][and][sink]** as indicated on Drawings.
- B. Plastic Laminate: HDPL complying with ISO 4586-3, **[Grade HGS][Grade HGF][Grade HGP]**.
 - 1. Colors, Patterns, and Finishes: **[As indicated by manufacturer's designations][As selected by Architect from casework manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range of solid colors]<Insert requirements>**.
- C. Chemical-Resistant Plastic Laminate: HDPL complying with ISO 4586-3, Grade HGP, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Wilsonart LLC]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Wilsonart LLC]**
 - e. **<Insert manufacturer's name>**
 - 3. Physical Properties: Minimum acceptable chemical-resistance performance to result in no more than four (4) Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.
 - 4. Color: **[Black][As indicated by manufacturer's designations][As selected by Architect from chemical-resistant, plastic-laminate manufacturer's full range]<Insert requirements>**.
- D. Core Materials for Plastic Laminate:
 - 1. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
 - 2. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
 - 3. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
 - 4. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and

standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."

5. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
6. Composite Wood Products: Products shall be made without urea formaldehyde.
7. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
8. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
9. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:

- a. Hardwood Plywood: 0.05 ppm.
- b. Particleboard: 0.09 ppm.
- c. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
- d. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.

10. Composite Wood Products: Products shall be made without urea formaldehyde.
11. Particleboard: ANSI A208.1, Grade M-2.

- a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.

12. Exterior-Glue Particleboard: ANSI A208.1, Grade M-2, exterior glue.

- a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.

13. Exterior Plywood: DOC PS 1, **[Exterior A-C][Exterior B-C]** with fully sanded face.

- E. Adhesive for Bonding Plastic Laminate: **[Type I, waterproof type][Type II water-resistant type]** as selected by fabricator to comply with requirements.

1. Adhesives: Do not use adhesives that contain urea formaldehyde.
2. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesives: Do not use adhesives that contain urea formaldehyde.
5. Adhesives: Do not use adhesives that contain urea formaldehyde.

- F. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[American Epoxy Scientific LLC]**

- b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Epoxy Scientific LLC]**
 - b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**
 - d. **<Insert manufacturer's name>**
 3. Physical Properties:
 - a. Flexural Strength: Not less than **10,000 psi (70 MPa)**.
 - b. Modulus of Elasticity: Not less than **2,000,000 psi (1400 MPa)**.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than **260 deg F (127 deg C)**.
 - f. Chemical Resistance: Minimum acceptable chemical-resistance performance to result in no more than four (4) Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - 1) **<Insert chemical reagent>**.
 4. Color: **[Black][Gray][Beige][White][As selected by Architect from epoxy manufacturer's full range]<Insert requirements>**.
- G. Phenolic Composite: Solid, high-pressure decorative laminate, complying with ISO 4586-4, Grade CGS.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Trespa North America]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Trespa North America]**
 - e. **<Insert manufacturer's name>**
 3. Chemical Resistance: Minimum acceptable chemical-resistance performance to result in no more than four (4) Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.

4. Color: **[Black][Gray][Beige][White][As selected by Architect from phenolic-composite manufacturer's full range]<Insert requirements>**.

H. Stainless Steel Sheet: ASTM A240/A240M, **[Type 304][Type 316L]**.

2.9 CABINET FABRICATION

A. Construction: Provide plastic-laminate laboratory casework of the following minimum construction:

1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: **3/4-inch- (19-mm-)** thick particleboard.
2. Shelves: **3/4-inch- (19-mm-)** thick **[particleboard][plywood]**.
3. Exposed Backs of Cabinets: **1/2-inch- (13-mm-)** thick particleboard or MDF.
4. Backs of Cabinets: **[1/4-inch- (6.4-mm-) thick hardboard][1/4-inch- (6.4-mm-) thick, veneer-core hardwood plywood]** dadoed into sides, bottoms, and tops where not exposed unless otherwise indicated.
5. Drawer Fronts: **3/4-inch- (19-mm-)** thick particleboard.
6. Drawer Sides and Backs: **1/2-inch- (13-mm-)** thick **[solid-wood or veneer-core hardwood plywood][particleboard or MDF]**, with glued dovetail or multiple-dowel joints.
7. Drawer Bottoms: **1/4-inch- (6.4-mm-)** thick **[hardwood plywood][particleboard or MDF]** glued and dadoed into front, back, and sides of drawers.
 - a. Use **1/2-inch- (13-mm-)** thick material for drawers more than **24 inches (600 mm)** wide.
8. Drawer Bodies: Steel drawer pans formed from **0.036-inch- (0.91-mm-)** thick metal, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat and **2 mils (0.05 mm)** for system.
9. Doors Less Than 48 Inches (1200 mm) High: **3/4 inch (19 mm)** thick, with particleboard or MDF cores.
 - a. Provide solid-wood stiles and rails.
10. Doors More Than 48 Inches (1200 mm) High: **[1-1/16 inches (27 mm) thick, with honeycomb cores and solid-hardwood stiles and rails][1-1/8 inches (29 mm) thick, with particleboard cores]**.
11. Stiles and Rails of Glazed Doors Less Than 48 Inches (1200 mm) High: **3/4 inch (19 mm)** thick, with particleboard cores.
12. Stiles and Rails of Glazed Doors More Than 48 Inches (1200 mm) High: **[1-1/16 inches (27 mm) thick, with solid-wood][1-1/8 inches (29 mm) thick, with particleboard]** cores.

B. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than **1-5/8 inches (41 mm)** square by **0.105-inch (2.66-mm)** nominal thickness, that are connected at top and bottom by U-shaped brackets made from **1-1/4-by-1/4-inch (32-by-6-mm)** steel flat bars. Framing units may be made by welding channel material into rectangular frames instead of using U-shaped brackets.

C. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.

D. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as adjacent exposed casework surfaces unless otherwise indicated.

1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where **[cabinets**

- are not installed against a wall or where space is not otherwise closed][indicated].**
- 2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
- 3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.10 COUNTERTOP FABRICATION

- A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of **1 inch (25 mm)**.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - 1. Outlets: Provide with strainers and tailpieces, **NPS 1-1/2 (DN 40)**, unless otherwise indicated.
 - 2. Overflows: **[For each sink except cup sinks,][Where indicated,]** provide overflow of standard beehive or open-top design with separate strainer. Height **2 inches (50 mm)** less than sink depth. Provide in same material as strainer.
- C. Plastic Laminate:
 - 1. Countertops: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to top surface and exposed edges of core with plastic-laminate backing bonded to bottom surface. Sand surfaces to which plastic laminate is to be bonded.
 - a. Top Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)][1-3/16 inches (30 mm)]**.
 - b. Backsplash Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
 - c. Countertop Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - d. Countertop Core for Counters Containing Sinks: **[Exterior-glue particleboard][or][exterior plywood]**.
 - e. Flat Configuration: With square edges, flat backsplashes, and flat end splashes. Finish faces and exposed edges of splashes with same plastic laminate as top.
 - f. Postformed Configuration: With **[raised,]** rolled edge and integral coved backsplash with rolled top edge. Construct top and backsplash from one piece of plastic laminate. Where indicated, provide separate end splashes of same material as top and fitted to top.
 - g. Plastic-Laminate Backer Sheet: HDPL complying with ISO 4586-3, grade to match exposed surface.
 - 2. Shelves: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to both faces and edges of core. Sand surfaces to which plastic laminate is to be bonded.
 - a. Shelf Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - b. Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
- D. Epoxy:
 - 1. Countertops: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.

- b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.
 - c. Construction: **[Uniform throughout full thickness][Epoxy composition not less than 1/4 inch (6 mm) thick, laminated to backing]**.
 - d. Product Option: Phenolic-composite countertops may be substituted for epoxy countertops at Contractor's option.
2. Sinks: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; **1/2-inch (13-mm)** minimum thickness.
- a. Provide with polypropylene strainers and tailpieces.
 - b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
 - c. Provide sinks for drop-in installation with **1/4-inch- (6-mm-)** thick lip around perimeter of sink.
 - d. Provide sinks for underside installation with manufacturer's recommended adjustable support system for table- and cabinet-type installations.

E. Phenolic-Composite:

- 1. Countertops: Fabricate with cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[1/2-inch (13-mm)][5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with raised edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
- 2. Shelves: Flat, **[5/8 inch (16 mm)][3/4 inch (19 mm)]** thick.
 - a. Edges and Corners: **[Beveled][Rounded]**.

F. Stainless Steel:

- 1. Countertops: Made from stainless steel sheet, not less than **0.062-inch (1.59-mm)** nominal thickness, with ASTM A480/A480M No. 4 satin finish.
 - a. Extend top down **1 inch (25 mm)** at edges with a **1/2-inch (13-mm)** return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
 - b. Form backsplash coved to and integral with top surface.
 - c. Provide raised (marine) edge **[around perimeter of countertops containing sinks][and][where indicated]**.
 - d. Pitch countertops that contain sinks two ways to sink[, **where indicated,**] without channeling or grooving.
 - e. Factory punch holes for service fittings.
 - f. Reinforce underside of countertop with channels, or use thicker metal sheet where

- g. Weld shop-made joints.
 - h. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
 - i. Where stainless steel sinks and cup sinks occur in stainless steel countertops, factory weld into one integral unit.
 - j. After fabricating and welding, grind surfaces smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- 2. Shelves: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness, with ASTM A480/A480M No. 4 satin finish. Weld shop-made joints. Fold **[down][up]** front edge **3/4 inch (19 mm)**; fold up back edge **3 inches (75 mm)**.
 - a. Provide integral stiffening brackets, formed by folding up ends **3/4 inch (19 mm)** and welding to upturned **[back edge][front and back edges]**.
 - b. After fabricating, grind welds smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- 3. Sinks: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Slope sink bottoms to outlet. Provide continuous butt-welded joints.
 - a. Provide double-wall construction for sink partitions with top edge rounded to at least **1/2-inch (13-mm)** diameter.
 - b. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
 - c. Factory punch holes for fittings.
 - d. Provide with stainless steel strainers and tailpieces.
 - e. Provide with integral rims except where located in stainless steel countertops.
 - f. Apply **1/8-inch- (3-mm-)** thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.
- G. Cup Sinks: Provide in material indicated, **[3-by-6-inch (75-by-150-mm) oval][3-by-9-inch (75-by-228-mm) oval][5-inch (127-mm) diameter][as indicated on Drawings]<Insert requirements>**.
 - 1. Epoxy Cup Sinks: Provide with polypropylene strainers and integral tailpieces.
 - 2. Polypropylene Cup Sinks: Provide with polypropylene strainers and integral tailpieces.
 - 3. Stainless Steel Cup Sinks: Provide with stainless steel strainers and integral tailpieces.
- H. Troughs: Provide in material indicated and pitch to drains not less than **1/8 inch/foot (10 mm/m)**. Except where troughs empty into sinks, provide **NPS 1-1/2 (DN 40)** outlets with strainers and tailpieces.
 - 1. Epoxy Troughs: Molded in one piece with smooth surfaces and coved corners; **[1/2-inch (13-mm)][5/8-inch (16-mm)][3/4-inch (19-mm)]** minimum thickness. Provide polypropylene strainers and tailpieces.
 - 2. Stainless Steel Troughs: Made from stainless steel sheet, not less than **[0.050-inch (1.27-mm)][0.062-inch (1.59-mm)]** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean. Provide stainless steel strainers and tailpieces.

2.11 LABORATORY ACCESSORIES

- A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.
- B. Burette Rods: Aluminum or stainless steel rods, **1/2 inch (13 mm)** in diameter and **18 inches (450 mm)** long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.
- C. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and one horizontal crossbar, **3/4 inch (19 mm)** in diameter and **36 inches (900 mm)** long unless otherwise indicated; two flush socket receptacles and two crossbar clamps. Ends of vertical rods are tapered to fit receptacles; other rod ends are rounded.
- D. Greenlaw Arm Assembly: Aluminum or stainless steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.
- E. Lattice Assembly: Aluminum or stainless steel, vertical and horizontal rod lattice assembly with **3/4-inch- (19-mm-)** diameter rods at approximately **12 inches (300 mm)** o.c. with two flush socket receptacles for mounting.
 - 1. Size: **[36 inches (900 mm)][48 inches (1200 mm)]** wide by **[24 inches (600 mm)][36 inches (900 mm)]** high.
- F. Plastic or Resin Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.
- G. Stainless Steel Pegboards: Stainless steel pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.

2.12 WATER AND LABORATORY GAS SERVICE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Broen A/S]**
 - 2. **[Chicago Faucets; Geberit Group]**
 - 3. **[WaterSaver Faucet Co]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Broen A/S]**
 - 2. **[Chicago Faucets; Geberit Group]**
 - 3. **[WaterSaver Faucet Co]**
 - 4. **<Insert manufacturer's name>**
- C. Service Fittings: Provide units that comply with SEFA 7, "Laboratory Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

1. Provide units that comply with "Vandal-Resistant Fittings" recommendations in SEFA 7.
- D. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.
- E. Finish: **[Chromium plated][Chromium plated unless otherwise indicated][Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes]**.
1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.
- F. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to **80 psig (550 kPa)**.
1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
 2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
 3. Self-Closing Valves: Provide self-closing valves where indicated.
- G. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than **5 lbf (22 N)** to operate. Provide units designed for working pressure up to **75 psig (520 kPa)**, with serrated outlets.
1. Locking Safety Handles: Where ball valves are indicated for fuel-gas use, provide handles that must be **[pushed in][or][pulled up]** before being turned on.
- H. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to **40 psig (280 kPa)**, with serrated outlets.
- I. Steam Valves: Stainless steel seat and PTFE seat disc. Provide units designed for steam working pressure up to **20 psig (140 kPa)**, with serrated outlets.
- J. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
1. Provide units designed for working pressure up to **[60 psig (410 kPa)][100 psig (690 kPa)][125 psig (860 kPa)][as indicated on Drawings][as indicated in schedules]<Insert requirements>**.
- K. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."
- L. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.
- M. Handles: Provide **[three- or four-arm, forged-brass][or][three- or four-wing, molded-plastic or powder-coated-metal]** handles for valves unless otherwise indicated.
1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 3. Provide heat-resistant plastic handles for steam valves.
 4. Provide knurled, molded-plastic handles for needle valves.

- N. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.13 ELECTRICAL AND COMMUNICATION SERVICE FITTINGS

- A. Service Fittings, General: Provide units complete with metal housings, receptacles, switches, pilot lights, **[data communication outlets,]** cover plates, accessories, and gaskets required for mounting on laboratory casework.
- B. Electrical Wiring Devices: Comply with requirements in Section 262726 "Wiring Devices" for receptacles, switches, pilot lights, cover plates, and accessories.
- C. Twisted-Pair Copper Data Outlets: Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- D. Optical Fiber Data Outlets: Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling."
- E. Receptacles:
 - 1. Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 2. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, and FS W-C-596.
 - 3. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 4. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1310, and FS W-C-596.
 - b. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 - 5. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1310, and FS W-C-596.
 - b. Marking: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
 - 6. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 - 7. Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; **[feed][non-feed]**-through type with integral LED indicator light.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 943 Class A, and FS W-C-596.
 - 8. Hospital-Grade, Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6,

Configuration 5-20R; [feed][non-feed]-through type with integral LED indicator light.

- a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 943 Class A, and FS W-C-596.
9. Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.
10. Isolated-Ground, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.
11. Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.
12. Isolated-Ground, Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R; with integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.
13. Color of Receptacles: [Brown][Ivory][As selected by Architect]<Insert color> unless otherwise indicated or required by NFPA 70.

F. Switches:

1. Single-Pole Switches: 120/277 V, 20 A.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
2. Two-Pole Switches: 120/277 V, 20 A.
 - a. Comply with NEMA WD 1, UL 20, and FS W-S-896.
3. Pilot-Light Switches, Single Pole: 120/277 V, 20 A, with LED-lighted handle, illuminated when switch is off.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
4. Key-Operated Switches: 120/277 V, 20 A; single pole, with factory-supplied key in lieu of switch handle.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
5. Color of Switches: [Brown][Ivory][As selected by Architect]<Insert color> unless otherwise indicated or required by NFPA 70.

- G. Data Communication Outlets: Two RJ-45 jacks for terminating 100-ohm, balanced, four-pair twisted-pair cabling complying with TIA-568-C.1; complying with [Category 5e][Category 6]<Insert category>.

Comply with UL 1863.

- H. Cover Plates: Provide satin-finish, **[chrome-plated][Type 304, stainless steel]** cover plates with formed, beveled edges.
- I. Cover-Plate Identification: Use **1/4-inch- (6-mm-)** high letters unless otherwise indicated. For stainless steel or chrome-plated metal, stamp or etch plate and fill in letters with black enamel.
 - 1. Provide **[at every cover plate.][at the following locations:]**
 - a. Receptacles other than standard 125-V duplex, grounding type.
 - b. Switches and thermal-overload switches.
 - c. Pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Receptacles, switches, and other locations indicated.
 - 2. Provide the following information:
 - a. Voltage and phase for receptacles other than standard 125-V duplex, grounding type.
 - b. Indicate equipment being controlled by switches and thermal-overload switches.
 - c. Indicate equipment being controlled for pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Number of the breaker in panelboard that controls device.
- J. Pedestal-Type Fittings: Cast-aluminum housings with sloped single face or two faces, as indicated, with neoprene gasket under base and with concealed mounting holes in base for attaching to laboratory casework. Provide holes tapped for conduits.
- K. Line-Type Fittings: Provide with cast-metal boxes with threaded holes for mounting on rigid steel conduit. Provide cover plates same size as boxes.
- L. Recessed-Type Fittings: Provide with galvanized-steel boxes.
- M. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CASEWORK

- A. Comply with installation requirements in SEFA 2. Install level, plumb, and true in line; shim as required using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: **1/16 inch in 10 feet (1.5 mm in 3 m)**.
 2. Variation of Bottoms of Upper Cabinets from Level: **1/8 inch in 10 feet (3 mm in 3 m)**.
 3. Variation of Faces of Casework from a True Plane: **1/8 inch in 10 feet (3 mm in 3 m)**.
 4. Variation of Adjacent Surfaces from a True Plane (Lippage): **1/32 inch (0.8 mm)**.
 5. Variation in Alignment of Adjacent Door and Drawer Edges: **1/16 inch (1.5 mm)**.
- B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.
- C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than **16 inches (400 mm)** o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than **24 inches (600 mm)** o.c. and at sides of cabinets with not less than two fasteners per side.
- D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than **16 inches (400 mm)** o.c.
- E. Install hardware uniformly and precisely.
- F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Comply with installation requirements in SEFA 2. Abut top and edge surfaces true in plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints where indicated on Shop Drawings.
- B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.
1. Plastic-Laminate Countertops: Secure field-made joints using concealed clamping devices located within **6 inches (150 mm)** of front and back edges and at intervals not exceeding **24 inches (600 mm)**. Tighten in accordance with manufacturer's written instructions to exert a uniform heavy pressure at joints.
- C. Fastening:
1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than **48 inches (1200 mm)** o.c.
 3. Where necessary to penetrate countertops with fasteners, countersink heads approximately **1/8 inch (3 mm)** and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide holes and cutouts required for service fittings.
- E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
- F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as

recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

- G. Dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

- A. Comply with installation requirements in SEFA 2.
- B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
- C. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.
- D. Semiflush Installation of Stainless Steel Sinks: Before setting, apply sink and countertop manufacturers' recommended sealant under rim lip and along top. Remove excess sealant while still wet and finish joint for neat appearance.
- E. Installation of Epoxy and Polypropylene Cup Sinks:
 - 1. Drop-in Installation: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
 - 2. Surface Installation: Set sink in sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

- A. Install accessories in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, stainless steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and

electrical devices.

- B. Install fittings in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Protect countertop surfaces during construction with **6-mil (0.15-mm)** plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of **48 inches (1200 mm)** o.c.

3.8 SERVICE-FITTING SCHEDULE

- A. Water Service Fitting: Type WF-[#].
 - 1. Fitting Type: **[Swing-spout mixing faucet][Rigid, gooseneck mixing faucet][Rigid, gooseneck, single-service faucet][Remote-control, rigid, gooseneck, single-service faucet][Single-service hose bib]**.
 - 2. Outlet: **[Aerator][Vacuum breaker and removable serrated outlet]**.
 - 3. Mounting: **[Wall][Deck][Line]** mounted.
 - 4. Additional Requirements: **[Self-closing valves][For reagent-grade water]<Insert requirement>**.
- B. Laboratory Steam Service Fitting: Type SF-[#].
 - 1. Fitting Type: **[Turret][Line mounted][Flange type][Remote-control turret][Remote-control flange type]**.
 - 2. Outlets: **[One][Two, at 90 degrees][Two, at 180 degrees][Three][Four]**.
 - 3. Outlet Type: **[Straight][Angled]**.
- C. Laboratory Gas Service Fitting: Type GF-[#].
 - 1. Service: **[Air][Gas (fuel gas)][Vacuum]<Insert service>**.
 - 2. Fitting Type: **[Turret][Line mounted][Flange type][Remote-control turret][Remote-control flange type]**.
 - 3. Outlets: **[One][Two, at 90 degrees][Two, at 180 degrees][Three][Four]**.
 - 4. Outlet Type: **[Straight][Angled]**.
 - 5. Valve Type: **[Ground-key cock][Ball valve][Needle valve]**.
- D. Electrical Service Fitting: Type EF-[#].
 - 1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.
 - 2. Device: **[One duplex receptacle][Two duplex receptacles][Four duplex receptacles][One switched receptacle][One duplex receptacle, switch, and pilot light]**.
 - 3. Additional Requirements: **[GFCI][SPD]** receptacles.
- E. Communication Service Fitting: Type CF-[#].
 - 1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.

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2. Device: **[One duplex communication receptacle][Two duplex receptacles]**.

F. Electrical and Communication Service Fitting: Type ECF-[#].

1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.
2. Device: **[One duplex receptacle and one duplex communication receptacle][Two duplex receptacles and two duplex communication receptacles][One switched receptacle and one duplex communication receptacle]**.
3. Additional Requirements: **[GFCI][SPD]** receptacles.

END OF SECTION 12 35 00 00

SECTION 12 35 00 00A - WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood laboratory casework.
2. Auxiliary cabinets.
3. Countertops.
4. Laboratory casework systems.
5. Laboratory accessories.
6. Water and laboratory gas service fittings.
7. Electrical and communication service fittings.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring laboratory casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to laboratory casework.
4. Section 115313 "Laboratory Fume Hoods" for fume hoods[, **including base cabinets and countertops under fume hoods**].

1.2 DEFINITIONS

- A. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.
- B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than **48 inches (1200 mm)** above floor, and visible surfaces in open cabinets or behind glass doors.
1. Ends of cabinets are defined as "exposed"[**except ends are defined as "concealed" where installed directly against and completely concealed by walls or other cabinets**].
- C. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases **78 inches (1980 mm)** or more above floor and bottoms of cabinets more than **24 inches (600 mm)** but less than **48 inches (1200 mm)** above floor are defined as "semiexposed."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
- B. Keying Conference: Conduct conference at **[Project site]<Insert location>**. Incorporate keying conference decisions into final keying requirements.

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
- B. Coordinate installation of laboratory casework with installation of laboratory equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
 - 2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. Shop Drawings: For laboratory casework.
 - 1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
 - 2. Indicate types and sizes of casework.
 - 3. Indicate manufacturer's catalog numbers for casework.
 - 4. Show fabrication details, including types and locations of hardware.
 - 5. Indicate locations and types of service fittings.
 - 6. Include details of utility spaces showing supports for conduits and piping.
 - 7. Include details of support framing system.
 - 8. Include details of exposed conduits, if required, for service fittings.
 - 9. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and laboratory equipment.
 - 10. Include coordinated dimensions for laboratory equipment specified in other Sections.
- D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- E. Samples: For casework finishes and materials requiring color selection.
- F. Samples for Initial Selection: For casework finishes and materials requiring color selection.
- G. Samples for Verification: For each type of casework, exposed-hardware, and countertop-material finish, in manufacturer's standard sizes.
 - 1. Base Cabinet: One full-size[, **16-inch- (406-mm-)**]**<Insert dimension>** wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
 - 2. Wall Cabinet: One full-size[, **12-inch- (304-mm-)**]**<Insert dimension>** wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.

3. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.

- H. Delegated Design Submittals: For laboratory casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports:
 1. Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard[**and system structural performance specified in "Performance Requirements" Article**].
 2. Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface material with requirements specified for chemical and physical resistance.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of casework finish provided. Include fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Cabinet Mounting Clips and Related Hardware: Quantity equal to **[5]<Insert number>** percent of amount installed, but no fewer than **[20]<Insert number>** of each type.
 2. Modular Countertop Units: **[Two]<Insert number>** extra units of each length and material installed.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 W.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

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1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet-work are complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Field Measurements: Where laboratory casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- B. Obtain **[countertops][sinks][accessories][and][service fittings]** from casework manufacturer.
- C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. System Structural Performance: Laboratory casework and support framing system to withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
 - 1. Support Framing System: **[600 lb/ft. (900 kg/m)]<Insert value>**.
 - 2. Suspended Base Cabinets (Internal Load): **[160 lb/ft. (240 kg/m)]<Insert value>**.
 - 3. Work Surfaces (Including Tops of Suspended Base Cabinets): **[160 lb/ft. (240 kg/m)]<Insert value>**.
 - 4. Wall Cabinets (Upper Cabinets): **[160 lb/ft. (240 kg/m)]<Insert value>**.
 - 5. Shelves: **[40 lb/sq. ft. (200 kg/sq. m)]<Insert value>**.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality

Requirements," to design laboratory casework installation.

- C. Seismic Performance: Laboratory casework installation to withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirements>.
1. Design earthquake spectral response acceleration, short period (Sds) for Project is [indicated on Drawings]<Insert requirements>.
 2. Component Importance Factor: [1.0][1.5].
 3. Base Cabinet Load (Including Countertop and Load on Countertop): [320 lb/ft. (480 kg/m)]<Insert value>.
 4. Wall Cabinet (Upper Cabinet) Load: [160 lb/ft. (240 kg/m)]<Insert value>.

2.3 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."
- B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by [a testing and inspecting agency acceptable to authorities having jurisdiction][FM Approvals].
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- E. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site.
- F. Regional Materials: Wood products shall be manufactured within **100 miles (160 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles (160 km)** of Project site.
- G. Indigenous Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- H. Regional Materials: Wood products shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- I. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- J. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
- K. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
- L. Certified Wood: Wood products shall [contain not less than 60 percent][be made from] certified wood

tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."

- M. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

2.4 WOOD LABORATORY CASEWORK

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Bedcolab]**
2. **[CIF Lab Solutions LP]**
3. **[Diversified Woodcrafts, Inc.]**
4. **[ICIScientific]**
5. **[Kewaunee Scientific Corporation]**
6. **[Leonard Peterson & Company, Inc]**
7. **[Mott Manufacturing Ltd]**
8. **[Sheldon Laboratory Systems]**
9. **[South Texas Woodmill, Inc.]**
10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Bedcolab]**
2. **[CIF Lab Solutions LP]**
3. **[Diversified Woodcrafts, Inc.]**
4. **[ICIScientific]**
5. **[Kewaunee Scientific Corporation]**
6. **[Leonard Peterson & Company, Inc]**
7. **[Mott Manufacturing Ltd]**
8. **[Sheldon Laboratory Systems]**
9. **[South Texas Woodmill, Inc.]**
10. **<Insert manufacturer's name>**

- C. Design: **[Lipped overlay with radiused edges][Reveal overlay with square edges][Reveal overlay with radiused edges].**

1. Provide **[1/8-inch (3.2-mm)]<Insert dimension>** reveals between doors and drawers that are adjacent.

- D. Wood Species: **[Red oak][White birch][Red birch][Alder][White maple][Hickory]<Insert requirements>**.

1. Wood Stain Colors and Finishes: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from casework manufacturer's full range]<Insert requirements>**.

- E. Cut: **[Plain sliced/sawn][Quarter sliced/sawn][Rift cut/sawn][Rotary cut/plain sawn]<Insert requirements>**.

F. Veneer Matching:

1. None required; select and arrange veneers for compatible grain and color.
2. Provide veneers for each cabinet from a single flitch, **[book and running][slip and running][book or slip and running][book and balance][slip and balance][book or slip and balance]** matched.
 - a. Provide continuous matching of adjacent drawer fronts within each cabinet.
3. Provide veneers for each elevation from a single flitch, **[book and running][slip and running][book or slip and running][book and balance][slip and balance][book or slip and balance]** matched.
 - a. Provide continuous matching of adjacent drawer fronts within each cabinet and end matching between drawer fronts of adjacent cabinets.

G. Grain Direction:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: **[Vertical with continuous vertical matching][Horizontal]**.
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

H. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Plywood: Hardwood plywood, either veneer core or particleboard core with face veneer of species indicated. Grade A exposed faces, at least **1/50 inch (0.5 mm)** thick, and Grade J crossbands. Provide backs of same species as faces.
3. Solid Wood: Clear hardwood lumber of species indicated.
4. Edgebanding: **[Solid wood, minimum 1/8 inch (3 mm) thick and of same species as face veneer][Wood veneer of same species as face veneer][PVC]**.
 - a. PVC Edgebanding Color: **[Casework manufacturer's standard][As selected by Architect from casework manufacturer's full range]<Insert requirements>**.

I. Semiexposed Materials:

1. Wood: Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
 - a. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of **[species similar in color and grain to][same species as]** exposed solid wood.
 - b. Plywood: Hardwood plywood of **[species similar in color and grain to][same species as]** exposed plywood. Provide backs of same species as faces.
 - 1) Grade: **[B][C]** faces and Grade J crossbands.
2. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

J. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

2.5 WOOD CABINET MATERIALS

A. General:

1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

E. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:

1. Hardwood Plywood: 0.05 ppm.
2. Particleboard: 0.09 ppm.
3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

F. Composite Wood Products: Products shall be made without urea formaldehyde.

G. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

H. MDF: Medium-density fiberboard, ANSI A208.2, [Grade 130]<Insert grade>.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

I. Particleboard: ANSI A208.1, Grade M-2.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

J. Hardboard: ANSI A135.4, Class 1 tempered.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

K. Adhesives: Do not use adhesives that contain urea formaldehyde.

- L. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- M. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- N. Adhesives: Do not use adhesives that contain urea formaldehyde.
- O. Adhesives: Do not use adhesives that contain urea formaldehyde.
- P. PVC Edgebanding for Wood: Rigid PVC extrusions, through color with satin finish, 3.0 mm thick at doors and drawer fronts, 1.0 mm thick elsewhere.

2.6 AUXILIARY CABINETS

- A. Acid Storage-Cabinet Lining: **1/4-inch- (6-mm-)** thick, **[glass-fiber cement board complying with ASTM C1186][polyethylene or polypropylene][polyethylene, polypropylene, epoxy, or phenolic-composite lining material]**.
- B. Float Glass for Glazed Doors: Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than **[3.0 mm][4.0 mm][5.0 mm][6.0 mm]** thick.
- C. Tempered Glass for Glazed Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
- D. Laminated Glass for Glazed Doors: Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- E. Frameless Glass Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than **[5.0 mm][6.0 mm]** thick; with exposed edges seamed before tempering.

2.7 CABINET HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Butt Hinges: **[Stainless][Epoxy-coated-]** steel, five-knuckle hinges complying with ANSI/BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors **48 inches (1200 mm)** high or less and three for doors more than **48 inches (1200 mm)** high.
- C. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, Type B01602[, **self-closing**]. Provide two for doors **48 inches (1200 mm)** high or less and three for doors more than **48 inches (1200 mm)** high.
 - 1. Degrees of Opening: **[100][135][170]**.
- D. Hinged-Door and Drawer Pulls: **[Solid-aluminum, stainless steel, or chrome-plated-brass][Epoxy-coated-steel]**, back-mounted pulls. Provide two pulls for drawers more than **24 inches (600 mm)** wide.

1. Design: **[Wire pulls][Rectangular loop pulls][Rectangular loop pulls with rounded corners][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
 2. Overall Size: **[1 by 4-1/2 inches (25 by 114 mm)][1-1/4 by 4-1/2 inches (32 by 114 mm)][1-3/8 by 5-1/2 inches (35 by 140 mm)][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
- E. Sliding-Door Pulls: **[Stainless steel or chrome-plated][Epoxy-coated-steel]** recessed flush pulls.
1. Design and Size: **[Round, 3/4-inch (19-mm) diameter by 1/8 inch (3 mm) deep][Round, 3/4-inch (19-mm) diameter by 3/16 inch (5 mm) deep][Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep][As selected from manufacturer's full range][As indicated]<Insert requirements>**.
- F. Recessed Pulls: **[Aluminum][Polypropylene]**. Provide two pulls for drawers more than **24 inches (600 mm)** wide.
- G. Channel Pulls: Full-width, recessed solid-hardwood channels; matching exposed wood of cabinets.
- H. Door Catches: **[Nylon-roller spring][Dual, self-aligning, permanent magnet]** catches. Provide two catches on doors more than **48 inches (1200 mm)** high.
- I. Drawer Slides: ANSI/BHMA A156.9.
1. Manufacturer's standard.
 2. Standard Duty (Grade 1): **[Side mount][Undermount]**.
 3. Heavy Duty (Grade 1HD-100): **[Side mount][Undermount]**.
 - a. Type: **[Full][Full overtravel][Partial]** extension.
 - b. Material: **[Epoxy-coated polymer][Zinc-plated ball bearing]** slides.
 - c. Motion Feature: **[Soft close dampener][Self-closing mechanism]**.
 4. General-purpose drawers; provide **[100 lb (45 kg)]<Insert weight>** load capacity.
 5. File drawers; provide **[150 lb (45 kg)]<Insert weight>** load capacity.
- J. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately **1 by 2 inches (25 by 50 mm)**, attached with screws or rivets. Provide **[where indicated][on drawers]**.
- K. Locks: Cam type, brass with chrome-plated finish; complying with ANSI/BHMA A156.11, Type E07281[or Type E07261].
1. Tumbler: **[Disc][Five pin]**.
 2. Lock Locations: Provide **[where indicated][on drawers and doors]<Insert requirements>**.
 3. Keying: Key **[locks alike within each room; key each room separately][each lock separately][locks as directed]**.
 - a. Master key for up to **[225][500]<Insert number>** key changes.
 4. Key Quantity: Minimum of **[two]<Insert number>** keys per lock.
 5. Master Key System: Key locks to be operable by master key.
 - a. Master Keys: Provide **[two]<Insert number>**.
- L. Sliding-Door Hardware Sets: Laboratory casework manufacturer's standard, to suit type and size of

sliding-door units.

- M. Adjustable Shelf Supports: ANSI/BHMA A156.9, powder-coated steel **[shelf rests, Type B04013][standards, mortise type, and shelf rests, Type B04071 and Type B04091][standards, surface type, and epoxy powder-coated steel shelf brackets, Type B04102 and Type B04112]**.

2.8 COUNTERTOPS

- A. General: Provide laboratory **[tabletops][and]** countertops with integral **[shelf][trough][and][sink]** as indicated on Drawings.
- B. Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3.
1. Colors, Patterns, and Finishes: **[As indicated by manufacturer's designations][As selected by Architect from casework manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range][As selected by Architect from plastic-laminate manufacturer's full range of solid colors]<Insert requirements>**.
- C. Chemical-Resistant Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3, Grade HGP, and as follows.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[Arborite, Division of Wilsonart Canada ULC]**
- b. **[Formica Corporation]**
- c. **[Nevamar Company, LLC]**
- d. **[Wilsonart LLC]**
- e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Arborite, Division of Wilsonart Canada ULC]**
- b. **[Formica Corporation]**
- c. **[Nevamar Company, LLC]**
- d. **[Wilsonart LLC]**
- e. **<Insert manufacturer's name>**
3. Physical Properties: Minimum acceptable chemical-resistance performance is to result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
- a. **<Insert chemical reagent>**.
4. Color: **[Black][As indicated by manufacturer's designations][As selected by Architect from chemical-resistant, plastic-laminate manufacturer's full range]<Insert requirements>**.
- D. Core Materials for Plastic Laminate:
1. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
2. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"]

- according to FSC STD-01-001 and FSC STD-40-004.
 3. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
 4. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
 5. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 6. Composite Wood Products: Products shall be made without urea formaldehyde.
 7. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 8. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 9. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 10. Composite Wood Products: Products shall be made without urea formaldehyde.
 11. Particleboard: ANSI A208.1, Grade M-2.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
 12. Exterior-Glue Particleboard: ANSI A208.1, Grade M-2, exterior glue.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.
 13. Exterior Plywood: DOC PS 1, **[Exterior A-C][Exterior B-C]** with fully sanded face.
- E. Adhesive for Bonding Plastic Laminate: **[Type I, waterproof type][Type II water-resistant type]** as selected by fabricator to comply with requirements.
1. Adhesives: Do not use adhesives that contain urea formaldehyde.
 2. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Adhesives: Do not use adhesives that contain urea formaldehyde.
 5. Adhesives: Do not use adhesives that contain urea formaldehyde.

- F. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Epoxy Scientific LLC]**
 - b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Epoxy Scientific LLC]**
 - b. **[Durcon; a Wilsonart Company]**
 - c. **[Prime Industries, Inc]**
 - d. **<Insert manufacturer's name>**
 3. Physical Properties:
 - a. Flexural Strength: Not less than **10,000 psi (70 MPa)**.
 - b. Modulus of Elasticity: Not less than **2,000,000 psi (1400 MPa)**.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than **260 deg F (127 deg C)**.
 4. Chemical Resistance: Minimum acceptable chemical-resistance performance shall result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
 - a. **<Insert chemical reagent>**.
 5. Color: **[Black][Gray][Beige][White][As selected by Architect from epoxy manufacturer's full range]<Insert requirements>**.
- G. Phenolic Composite: Solid, high-pressure decorative laminate, complying with ISO 4586-4, Grade CGS.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**
 - b. **[Formica Corporation]**
 - c. **[Nevamar Company, LLC]**
 - d. **[Trespa North America]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Arborite, Division of Wilsonart Canada ULC]**

- b. [Formica Corporation]
 - c. [Nevamar Company, LLC]
 - d. [Trespa North America]
 - e. <Insert manufacturer's name>
3. Chemical Resistance: Minimum acceptable chemical-resistance performance is to result in no more than four Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.
- a. <Insert chemical reagent>.
4. Color: [Black][Gray][Beige][White][As selected by Architect from phenolic-composite manufacturer's full range]<Insert requirements>.
- H. Stainless Steel Sheet: ASTM A240/A240M, [Type 304][Type 316L].

2.9 WOOD CABINET FABRICATION

- A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W.
- 1. Bottoms of Base Cabinets and Tall Cabinets: **3/4-inch- (19-mm-)** thick, [veneer-core]hardwood plywood.
 - 2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: **1-inch- (25-mm-)** thick, veneer-core hardwood plywood.
 - 3. Ends of Cabinets: **3/4-inch- (19-mm-)** thick, hardwood plywood.
 - 4. Shelves: **1-inch- (25-mm-)** thick, veneer-core hardwood plywood.
 - 5. Base Cabinet Top Frames: **3/4-by-2-inch (19-by-50-mm)** solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
 - 6. Base Cabinet Stretchers: **3/4-by-4-1/2-inch (19-by-114-mm)** panel product strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed. [**May be provided as an option to base cabinet top frames.**]
 - 7. Base Cabinet Subtops: **3/4-inch- (19-mm-)** thick panel product, glued and pinned or screwed. [**May be provided as an option to base cabinet top frames.**]
 - 8. Exposed Backs of Cabinets: **3/4-inch- (19-mm-)** thick, [particleboard- or MDF-core]hardwood plywood.
 - 9. Unexposed Backs of Cabinets: [**1/4-inch- (6.4-mm-) thick hardboard**][**1/4-inch- (6.4-mm-) thick, hardwood plywood**][**1/2-inch- (13-mm-) thick, hardwood plywood**] dadoed into sides, bottoms, and tops unless otherwise indicated.
 - 10. Drawer Fronts: **3/4-inch- (19-mm-)** thick, [particleboard- or MDF-core]hardwood plywood or solid hardwood.
 - 11. Drawer Sides and Backs: **1/2-inch- (13-mm-)** thick, solid hardwood or [veneer-core]hardwood plywood, with glued dovetail or multiple-dowel joints.
 - 12. Drawer Bottoms: **1/4-inch- (6.4-mm-)** thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. [**Use 1/2-inch- (13-mm-) thick material for drawers more than 24 inches (600 mm) wide.**]
 - 13. Drawer Bodies: Steel drawer pans formed from **0.036-inch- (0.91-mm-)** thick metal, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat and **2 mils (0.05 mm)** for system.
 - 14. Doors Less Than 48 Inches (1200 mm) High: **3/4 inch (19 mm)** thick, with particleboard or MDF cores and hardwood face veneers and crossbands.
 - a. Provide solid-hardwood stiles and rails.

15. Doors More Than 48 Inches (1200 mm) High: **[1-1/16 inches (27 mm) thick, with honeycomb cores, solid-hardwood stiles and rails,][1-1/8 inches (29 mm) thick, with particleboard cores]** and hardwood face veneers and crossbands.
 16. Stiles and Rails of Glazed Doors Less Than 48 Inches (1200 mm) High: **3/4 inch (19 mm) thick.**
 - a. Material: **[Solid hardwood][Particleboard with hardwood face veneers and crossbands].**
 17. Stiles and Rails of Glazed Doors More Than 48 Inches (1200 mm) High: **[1-1/16-inch- (27-mm-) thick, solid wood][1-1/8-inch- (29-mm-) thick, particleboard cores]** with hardwood face veneers and crossbands.
- B. Tables: Solid-hardwood legs, not less than **2 inches (50 mm)** square with solid-hardwood stretchers as needed to comply with product standard. Bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. **[Provide leveling device at bottom of each leg.]**
1. Leg Shoes: Black vinyl or rubber, open-bottom, slip-on type.
- C. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than **1-5/8 inches (41 mm)** square by **0.105-inch (2.66-mm)** nominal thickness, that are connected at top and bottom by U-shaped brackets made from **1-1/4-by-1/4-inch (32-by-6-mm)** steel flat bars. Framing units may be made by welding channel material into rectangular frames instead of using U-shaped brackets.
- D. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.
- E. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as adjacent exposed casework surfaces unless otherwise indicated.
1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where **[cabinets are not installed against a wall or where space is not otherwise closed][indicated]**.
 2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
 3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.10 LABORATORY CASEWORK SYSTEMS

- A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular wood cabinets, filler and closure panels, **[wall panels,][undercabinet task-lighting fixtures,]** countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
 2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
 3. Sinks are supported independent of base cabinets.
 4. Support framing has provision for fastening pipe supports at utility space in not more than **1-inch (25-mm)** increments.
 5. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.
- B. Support Framing: Casework manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:

1. Cabinets, shelves, and countertops are supported from vertical supports[**except where floor-supported base cabinets are indicated**]. Vertical positioning of supported cabinets, shelves, and countertops can be varied in **1-inch (25-mm)** increments through full height of supports.
2. Vertical supports rest on adjustable leveling bases and are secured to floor with metal clips fastened to floor.
3. Vertical supports are installed with braces and rails, connecting them to each other and to permanent building walls to create a stable, rigid structure with framed utility spaces where indicated.

C. Undercabinet Task-Light Luminaires:

1. Lamp Type: [**LED**][**Single-tube fluorescent fixtures with ballast (sound rating A)**] with switch and heavy-duty cord and plug.
2. Finish: Baked enamel.
3. Diffusers: Virgin acrylic with high resistance to yellowing and other changes from aging, heat, and UV radiation.

D. Countertops: Provide in modular lengths indicated, without seams.

2.11 WOOD FINISH

- A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain to produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
- C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard [**two**][**three**]-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test to be no more than for Level 3 conditions.

2.12 COUNTERTOP FABRICATION

- A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of **1 inch (25 mm)**.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 1. Outlets: Provide with strainers and tailpieces, **NPS 1-1/2 (DN 40)**, unless otherwise indicated.
 2. Overflows: [**For each sink except cup sinks**],[**Where indicated**,] provide overflow of standard beehive or open-top design with separate strainer. Height **2 inches (50 mm)** less than sink depth. Provide in same material as strainer.
- C. Plastic Laminate:

1. Countertops: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to top surface and exposed edges of core with plastic-laminate backing bonded to bottom surface. Sand surfaces to which plastic laminate is to be bonded.
 - a. Top Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)][1-3/16 inch (30 mm)]**.
 - b. Backsplash Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
 - c. Countertop Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - d. Countertop Core for Counters Containing Sinks: **[Exterior-glue particleboard][or][exterior plywood]**.
 - e. Flat Configuration: With square edges, flat backsplashes, and flat end splashes. Finish faces and exposed edges of splashes with same HDPL plastic laminate as top.
 - f. Postformed Configuration: With **[raised,]** rolled edge and integral coved backsplash with rolled top edge. Construct top and backsplash from one piece of plastic laminate. Where indicated, provide separate end splashes of same material as top and fitted to top.
 - g. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.
 2. Tabletops: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to top surface and exposed edges of core with plastic-laminate backing bonded to bottom surface. Sand surfaces to which plastic laminate is to be bonded.
 - a. Tabletop Core: **[Particleboard][or][exterior plywood]**.
 - b. Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)][1-3/16 inches (30 mm)]**.
 - c. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.
 3. Shelves: **[Plastic][Chemical-resistant plastic]** laminate shop bonded to both faces and edges of core. Sand surfaces to which plastic laminate is to be bonded.
 - a. Shelf Core: **[Particleboard][exterior-glue particleboard][or][exterior plywood]**.
 - b. Core Thickness: **[3/4 inch (19 mm)][1 inch (25 mm)]**.
 - c. Plastic-Laminate Grade: **[HGS][HGF][HGP]**.
- D. Epoxy:
1. Countertops: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.
 - b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - 2) Backsplash: **[Integral coved][Applied]**.
 - c. Construction: **[Uniform throughout full thickness][Epoxy composition not less than 1/4 inch (6 mm) thick, laminated to backing]**.
 - d. Product Option: Phenolic-composite countertops may be substituted for epoxy countertops at Contractor's option.
 2. Tabletops:
 - a. Flat Configuration: **[5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with

continuous drip groove on underside at perimeter.

- 1) Edges and Corners: **[Beveled][Rounded]**.
- b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
- c. Tabletop Construction: **[Uniform throughout full thickness][Epoxy composition not less than 1/4 inch (6 mm) thick, laminated to backing]**.
- d. Product Option: Phenolic-composite tabletops may be substituted for epoxy tabletops at Contractor's option.
3. Sinks: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; **1/2-inch (13-mm)** minimum thickness.
 - a. Provide with polypropylene strainers and tailpieces.
 - b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
 - c. Provide sinks for drop-in installation with **1/4-inch- (6-mm-)** thick lip around perimeter of sink.
 - d. Provide sinks for underside installation with manufacturer's recommended adjustable support system for table- and cabinet-type installations.

E. Phenolic Composite:

1. Countertops: Fabricate with cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Flat Configuration: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside **1/2 inch (13 mm)** from overhang edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[1/2-inch (13-mm)][5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness, with raised edge and integral coved backsplash.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
2. Tabletops:
 - a. Flat Configuration: **[1/2 inch (13 mm)][5/8 inch (16 mm)][3/4 inch (19 mm)][1 inch (25 mm)]** thick with continuous drip groove on underside at perimeter.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
 - b. Marine-Edge Configuration: **[5/8-inch (16-mm)][3/4-inch (19-mm)][1-inch (25-mm)]** minimum thickness with integral or applied raised edge.
 - 1) Edges and Corners: **[Beveled][Rounded]**.
3. Shelves: Flat, **[5/8 inch (16 mm)][3/4 inch (19 mm)]** thick.

- a. Edges and Corners: **[Beveled][Rounded]**.

F. Stainless Steel:

1. Countertops: Made from stainless steel sheet, not less than **0.062-inch (1.59-mm)** nominal thickness, with ASTM A480/A480M No. 4 satin finish.
 - a. Extend top down **1 inch (25 mm)** at edges with a **1/2-inch (13-mm)** return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
 - b. Form backsplash coved to and integral with top surface.
 - c. Provide raised (marine) edge **[around perimeter of countertops containing sinks][and][where indicated]**.
 - d. Pitch countertops that contain sinks two ways to sink[, **where indicated,**] without channeling or grooving.
 - e. Factory punch holes for service fittings.
 - f. Reinforce underside of countertop with channels, or use thicker metal sheet where necessary to ensure rigidity without deflection.
 - g. Weld shop-made joints.
 - h. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
 - i. Where stainless steel sinks and cup sinks occur in stainless steel countertops, factory weld into one integral unit.
 - j. After fabricating and welding, grind surfaces smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
2. Shelves: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness, with ASTM A480/A480M No. 4 satin finish. Weld shop-made joints. Fold **[down][up]** front edge **3/4 inch (19 mm)**; fold up back edge **3 inches (75 mm)**.
 - a. Provide integral stiffening brackets, formed by folding up ends **3/4 inch (19 mm)** and welding to upturned **[back edge][front and back edges]**.
 - b. After fabricating, grind welds smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
3. Sinks: Made from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Slope sink bottoms to outlet. Provide continuous butt-welded joints.
 - a. Provide double-wall construction for sink partitions with top edge rounded to at least **1/2-inch (13-mm)** diameter.
 - b. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
 - c. Factory punch holes for fittings.
 - d. Provide with stainless steel strainers and tailpieces.
 - e. Provide with integral rims except where located in stainless steel countertops.
 - f. Apply **1/8-inch- (3-mm-)** thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

- G. Cup Sinks: Provide in material indicated, **[3-by-6-inch (75-by-150-mm) oval][3-by-9-inch (75-by-228-mm) oval][5-inch (127-mm) diameter][as indicated on Drawings]<Insert requirements>**.

1. Epoxy Cup Sinks: Provide with polypropylene strainers and integral tailpieces.

2. Polypropylene Cup Sinks: Provide with polypropylene strainers and integral tailpieces.
 3. Stainless Steel Cup Sinks: Provide with stainless steel strainers and integral tailpieces.
- H. Troughs: Provide in material indicated and pitch to drains not less than **1/8 inch/foot (10 mm/m)**. Except where troughs empty into sinks, provide **NPS 1-1/2 (DN 40)** outlets with strainers and tailpieces.
1. Epoxy Troughs: Molded in one piece with smooth surfaces and coved corners; [**1/2-inch (13-mm)**][**5/8-inch (16-mm)**][**3/4-inch (19-mm)**] minimum thickness. Provide polypropylene strainers and tailpieces.
 2. Stainless Steel Troughs: Made from stainless steel sheet, not less than [**0.050-inch (1.27-mm)**][**0.062-inch (1.59-mm)**] nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean. Provide stainless steel strainers and tailpieces.

2.13 LABORATORY ACCESSORIES

- A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.
- B. Burette Rods: Aluminum or stainless steel rods, **1/2 inch (13 mm)** in diameter and **18 inches (450 mm)** long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.
- C. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and one horizontal crossbar, **3/4 inch (19 mm)** in diameter and **36 inches (900 mm)** long unless otherwise indicated; two flush socket receptacles and two crossbar clamps. Ends of vertical rods are tapered to fit receptacles; other rod ends are rounded.
- D. Greenlaw Arm Assembly: Aluminum or stainless steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.
- E. Lattice Assembly: Aluminum or stainless steel, vertical and horizontal rod lattice assembly with **3/4-inch- (19-mm-)** diameter rods at approximately **12 inches (300 mm)** o.c. with two flush socket receptacles for mounting.
1. Size: [**36 inches (900 mm)**][**48 inches (1200 mm)**] wide by [**24 inches (600 mm)**][**36 inches (900 mm)**] high.
- F. Plastic or Resin Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.
- G. Stainless Steel Pegboards: Stainless steel pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.

2.14 WATER AND LABORATORY GAS SERVICE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [Broen A/S]
 2. [Chicago Faucets; Geberit Group]
 3. [WaterSaver Faucet Co]
 4. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Broen A/S]
 2. [Chicago Faucets; Geberit Group]
 3. [WaterSaver Faucet Co]
 4. <Insert manufacturer's name>
- C. Service Fittings: Provide units that comply with SEFA 7, "Recommended Practices for Fixtures." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
1. Provide units that comply with "Vandal-Resistant Fittings" recommendations in SEFA 7.
- D. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.
- E. Finish: [Chromium plated][Chromium plated unless otherwise indicated][Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes].
1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.
- F. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to **80 psig (550 kPa)**.
1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
 2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
 3. Self-Closing Valves: Provide self-closing valves where indicated.
- G. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than **5 lbf (22 N)** to operate. Provide units designed for working pressure up to **75 psig (520 kPa)**, with serrated outlets.
1. Locking Safety Handles: Where ball valves are indicated for fuel-gas use, provide handles that must be **[pushed in][or][pulled up]** before being turned on.
- H. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to **40 psig (280 kPa)**, with serrated outlets.
- I. Steam Valves: Stainless steel seat and PTFE seat disc. Provide units designed for steam working pressure up to **20 psig (140 kPa)**, with serrated outlets.
- J. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
1. Provide units designed for working pressure up to **[60 psig (410 kPa)][100 psig (690 kPa)][125 psig (860 kPa)][as indicated on Drawings][as indicated in schedules]<Insert requirements>**.

- K. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."
- L. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.
- M. Handles: Provide **[three- or four-arm, forged-brass][or][three- or four-wing, molded-plastic or powder-coated-metal]** handles for valves unless otherwise indicated.
 - 1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 - 2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 - 3. Provide heat-resistant plastic handles for steam valves.
 - 4. Provide knurled, molded-plastic handles for needle valves.
- N. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.15 ELECTRICAL AND COMMUNICATION SERVICE FITTINGS

- A. Service Fittings, General: Provide units complete with metal housings, receptacles, switches, pilot lights, **[data communication outlets,]** cover plates, accessories, and gaskets required for mounting on laboratory casework.
- B. Electrical Wiring Devices: Comply with requirements in Section 262726 "Wiring Devices" for receptacles, switches, pilot lights, cover plates, and accessories.
- C. Twisted-Pair Copper Data Outlets: Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- D. Optical Fiber Data Outlets: Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling."
- E. Receptacles:
 - 1. Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 2. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, and FS W-C-596.
 - 3. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R.
 - a. Standards: Comply with NEMA WD 1, UL 498, and FS W-C-596.
 - 4. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1310, and FS W-C-596.

- b. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 5. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1310, and FS W-C-596.
 - b. Marking: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
 6. USB Receptacles: **[Single][Dual][Quad]**, Type A.
 7. Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, **[feed][non-feed]**-through type with integral LED indicator light.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 943 Class A, and FS W-C-596.
 8. Hospital-Grade, Duplex GFCI Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, **[feed][non-feed]**-through type with integral LED indicator light.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 943 Class A, and FS W-C-596.
 9. Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, with LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.
 10. Isolated-Ground, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, with LED indicator light and integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498, UL 1449, and FS W-C-596.
 11. Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, with integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.
 12. Isolated-Ground Hospital-Grade, Duplex SPD Convenience Receptacles: 125 V, 20 A; NEMA WD 6, Configuration 5-20R, with integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. Standards: Comply with NEMA WD 1, UL 498 Supplement sd, UL 1449, and FS W-C-596.
 13. Color of Receptacles: **[Brown][Ivory][As selected by Architect]<Insert color>** unless otherwise indicated or required by NFPA 70.
- F. Switches:
1. Single-Pole Switches: 120/277 V, 20 A.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
 2. Two-Pole Switches: 120/277 V, 20 A.
 - a. Comply with NEMA WD 1, UL 20, and FS W-S-896.

3. Pilot-Light Switches, Single Pole: 120/277 V, 20 A, with LED-lighted handle, illuminated when switch is off.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
 4. Key-Operated Switches: 120/277 V, 20 A; single pole, with factory-supplied key in lieu of switch handle.
 - a. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
 5. Color of Switches: **[Brown][Ivory][As selected by Architect]<Insert color>** unless otherwise indicated or required by NFPA 70.
- G. Data Communication Outlets: Two RJ-45 jacks for terminating 100-ohm, balanced, four-pair twisted-pair cabling complying with TIA-568-C.1; complying with **[Category 5e][Category 6]<Insert category>**. Comply with UL 1863.
- H. Cover Plates: Provide satin-finish, **[chrome-plated][Type 304, stainless steel]** cover plates with formed, beveled edges.
- I. Cover-Plate Identification: Use **1/4-inch- (6-mm-)** high letters unless otherwise indicated. For stainless steel or chrome-plated metal, stamp or etch plate and fill in letters with black enamel.
1. Provide **[at every cover plate.][at the following locations:]**
 - a. Receptacles other than standard 125-V duplex, grounding type.
 - b. Switches and thermal-overload switches.
 - c. Pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Receptacles, switches, and other locations indicated.
 2. Provide the following information:
 - a. Voltage and phase for receptacles other than standard 125-V duplex, grounding type.
 - b. Indicate equipment being controlled by switches and thermal-overload switches.
 - c. Indicate equipment being controlled for pilot lights when located remotely from associated equipment or switch, where function is not obvious.
 - d. Number of the breaker in panelboard that controls device.
- J. Pedestal-Type Fittings: Cast-aluminum housings with sloped single face or two faces, as indicated, with neoprene gasket under base and with concealed mounting holes in base for attaching to laboratory casework. Provide holes tapped for conduits.
- K. Line-Type Fittings: Provide with cast-metal boxes with threaded holes for mounting on rigid steel conduit. Provide cover plates same size as boxes.
- L. Recessed-Type Fittings: Provide with galvanized-steel boxes.
- M. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CASEWORK

- A. Comply with installation requirements in SEFA 2. Install level, plumb, and true in line; shim as required using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: **1/16 inch in 10 feet (1.5 mm in 3 m)**.
 - 2. Variation of Bottoms of Upper Cabinets from Level: **1/8 inch in 10 feet (3 mm in 3 m)**.
 - 3. Variation of Faces of Casework from a True Plane: **1/8 inch in 10 feet (3 mm in 3 m)**.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): **1/32 inch (0.8 mm)**.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: **1/16 inch (1.5 mm)**.
- B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.
- C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than **16 inches (400 mm)** o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than **24 inches (600 mm)** o.c. and at sides of cabinets with not less than two fasteners per side.
- D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than **16 inches (400 mm)** o.c.
- E. Install hardware uniformly and precisely.
- F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Comply with installation requirements in SEFA 2. Abut top and edge surfaces true in plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints where indicated on Shop Drawings.
- B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.
 - 1. Plastic-Laminate Countertops: Secure field-made joints using concealed clamping devices located within **6 inches (150 mm)** of front and back edges and at intervals not exceeding **24 inches (600 mm)**. Tighten in accordance with manufacturer's written instructions to exert a

uniform heavy pressure at joints.

- C. Fastening:
 - 1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 - 2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than **48 inches (1200 mm)** o.c.
 - 3. Where necessary to penetrate countertops with fasteners, countersink heads approximately **1/8 inch (3 mm)** and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide holes and cutouts required for service fittings.
- E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
- F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
- G. Dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

- A. Comply with installation requirements in SEFA 2.
- B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
- C. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.
- D. Semiflush Installation of Stainless Steel Sinks: Before setting, apply sink and countertop manufacturers' recommended sealant under rim lip and along top. Remove excess sealant while still wet and finish joint for neat appearance.
- E. Installation of Epoxy and Polypropylene Cup Sinks:
 - 1. Drop-In Installation: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
 - 2. Surface Installation: Set sink in sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

- A. Install accessories in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, stainless steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.
- B. Install fittings in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Protect countertop surfaces during construction with **6-mil (0.15-mm)** plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of **48 inches (1200 mm)** o.c.

3.8 SERVICE-FITTING SCHEDULE

- A. Water Service Fitting: Type WF-[#].
 - 1. Fitting Type: **[Swing-spout mixing faucet][Rigid, gooseneck mixing faucet][Rigid, gooseneck, single-service faucet][Remote-control, rigid, gooseneck, single-service faucet][Single-service hose bib]**.
 - 2. Outlet: **[Aerator][Vacuum breaker and removable serrated outlet]**.
 - 3. Mounting: **[Wall][Deck][Line]** mounted.
 - 4. Additional Requirements: **[Self-closing valves][For reagent-grade water]<Insert requirement>**.
- B. Laboratory Steam Service Fitting: Type SF-[#].
 - 1. Fitting Type: **[Turret][Line mounted][Flange type][Remote-control turret][Remote-control flange type]**.
 - 2. Outlets: **[One][Two, at 90 degrees][Two, at 180 degrees][Three][Four]**.
 - 3. Outlet Type: **[Straight][Angled]**.
- C. Laboratory Gas Service Fitting: Type GF-[#].

12 - Furnishings



1. Service: **[Air][Gas (fuel gas)][Vacuum]<Insert service>**.
2. Fitting Type: **[Turret][Line mounted][Flange type][Remote-control turret][Remote-control flange type]**.
3. Outlets: **[One][Two, at 90 degrees][Two, at 180 degrees][Three][Four]**.
4. Outlet Type: **[Straight][Angled]**.
5. Valve Type: **[Ground-key cock][Ball valve][Needle valve]**.

D. Electrical Service Fitting: Type EF-[#].

1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.
2. Device: **[One duplex receptacle][Two duplex receptacles][Four duplex receptacles][One switched receptacle][One duplex receptacle, switch, and pilot light]**.
3. Additional Requirements: **[GFCI][SPD]** receptacles.

E. Communication Service Fitting: Type CF-[#].

1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.
2. Device: **[One duplex communication receptacle][Two duplex receptacles]**.

F. Electrical and Communication Service Fitting: Type ECF-[#].

1. Fitting Type: **[Pedestal, single faced][Pedestal, double faced][Recessed][Line mounted]**.
2. Device: **[One duplex receptacle and one duplex communication receptacle][Two duplex receptacles and two duplex communication receptacles][One switched receptacle and one duplex communication receptacle]**.
3. Additional Requirements: **[GFCI][SPD]** receptacles.

END OF SECTION 12 35 00 00A



Task	Specification	Specification Description
12 35 00 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 35 00 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 35 00 00	12 30 00 00b	Metal Laboratory Casework
12 35 00 00	12 35 70 00	Healthcare Casework
12 35 59 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 35 59 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 35 59 00	12 30 00 00b	Metal Laboratory Casework
12 35 59 00	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 35 59 00	12 35 00 00a	Wood Laboratory Casework
12 35 59 00	12 35 70 00	Healthcare Casework



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SECTION 12 35 70 00 - HEALTHCARE CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel healthcare casework.
2. Enameled-steel healthcare casework.
3. Specialty healthcare casework.
4. Stainless steel wall-mounted shelves.
5. Glazing.
6. Pegboards.
7. Casework hardware.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring healthcare casework and wall-mounted shelves.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring healthcare casework and wall-mounted shelves.
3. Section 123553.13 "Metal Laboratory Casework" for metal casework used in hospital laboratories.
4. Section 123616 "Metal Countertops" for stainless steel countertops and integral sinks.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:** Conduct conference **[at Project site][by web conference]<Insert location>** .
- B. Keying Conference:** Conduct conference **[at Project site][by web conference]<Insert location>** . Incorporate keying conference decisions into final keying requirements.

1.3 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of healthcare casework.**

1.4 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:**
1. Include plans, elevations, sections, and attachments to other work, including locations of blocking and reinforcements required for installation.
 2. Show fabrication details, including types and locations of hardware.
 3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.

4. Include coordinated dimensions for equipment specified in other Sections.
 5. Indicate manufacturer's catalog numbers for casework.
- C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- D. Samples: For casework and hardware finishes.
- E. Samples for Initial Selection: For casework and hardware finishes.
- F. Samples for Verification: For the following:
1. Hardware Finishes: For each type of exposed hardware indicated, in full-size units.
 2. Base Cabinet: One full-size, [16-inch- (406-mm-)]<Insert dimension> wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
 3. Wall Cabinet: One full-size, [12-inch- (304-mm-)]<Insert dimension> wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 4. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations.
- G. Delegated Design Submittals: For healthcare casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. For enameled-steel casework, furnish complete touchup kit for each type and color of casework finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.7 FIELD CONDITIONS

- A. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- B. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
- C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain casework from single source from single manufacturer.
- B. Product Designations: Drawings indicate sizes and configurations of healthcare casework by referencing designated manufacturer's catalog numbers. Other manufacturers' metal healthcare casework of similar sizes, of similar door and drawer configurations, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design healthcare casework installation.
- B. Seismic Performance: Healthcare casework, including attachments to other work, to withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirement> .
 - 1. Design earthquake spectral response acceleration, short period (Sds) for Project is <Insert value> .
 - 2. Component Importance Factor: [1.0][1.5] .

2.3 STAINLESS STEEL HEALTHCARE CASEWORK

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - 1. [Blickman Industries]
 - 2. [Carr Corporation]
 - 3. [Continental Metal Products Co. Inc.]
 - 4. [Inner Space, a Solaire Medical Company]
 - 5. [Scientek, a brand of Spire Integrated Solutions]
 - 6. [Skytron, LLC]
 - 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [Blickman Industries]
 - 2. [Carr Corporation]
 - 3. [Continental Metal Products Co. Inc.]
 - 4. [Inner Space, a Solaire Medical Company]
 - 5. [Scientek, a brand of Spire Integrated Solutions]
 - 6. [Skytron, LLC]
 - 7. <Insert manufacturer's name>
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, stretcher-leveled standard of flatness.
 - 1. Nominal Stainless Steel Thicknesses:

- a. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: **0.050 inch (1.27)**. Bottoms may be **0.038 inch (0.95 mm)** if reinforced.
- b. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: **0.038 inch (0.95 mm)** except **0.050 inch (1.27 mm)** for unreinforced shelves more than **36 inches (900 mm)** long.
- c. Intermediate Horizontal Rails, Center Posts, Tubular Legs, and Top Gussets: **0.062 inch (1.59 mm)**.
- d. Drawer Runners and Hinge Reinforcements: **0.078 inch (1.98 mm)**.
- e. Leveling and Corner Gussets: **0.109 inch (2.78 mm)**.

2.4 ENAMELED-STEEL HEALTHCARE CASEWORK

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

1. **[Blickman Industries]**
2. **[Carr Corporation]**
3. **[Continental Metal Products Co. Inc.]**
4. **[Inner Space, a Solaire Medical Company]**
5. **[Scientek, a brand of Spire Integrated Solutions]**
6. **[Skytron, LLC]**
7. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Blickman Industries]**
2. **[Carr Corporation]**
3. **[Continental Metal Products Co. Inc.]**
4. **[Inner Space, a Solaire Medical Company]**
5. **[Scientek, a brand of Spire Integrated Solutions]**
6. **[Skytron, LLC]**
7. **<Insert manufacturer's name>**

- C. Steel Sheet: Cold-rolled commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

1. Nominal Steel Thicknesses:
 - a. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: **0.048 inch (1.21 mm)**. Bottoms may be **0.036 inch (0.91 mm)** if reinforced.
 - b. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: **0.036 inch (0.91 mm)** except **0.048 inch (1.21 mm)** for unreinforced shelves more than **36 inches (900 mm)** long.
 - c. Intermediate Horizontal Rails, Center Posts, and Top Gussets: **0.060 inch (1.52 mm)**.
 - d. Drawer Runners and Hinge Reinforcements: **0.075 inch (1.90 mm)**.
 - e. Leveling and Corner Gussets: **0.105 inch (2.66 mm)**.

2.5 SPECIALTY HEALTHCARE CASEWORK

- A. Narcotics Cabinets: Construct of stainless steel as individual, freestanding units with finished sides and top and double-walled bottom. Provide with double-pan flush outer door and **0.062-inch- (1.59-mm-)**

nominal thickness, single-pan inner door, both with locks; each is individually keyed and not master keyed. Provide with stainless steel continuous hinges complying with BHMA A156.9, Grade 1.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Blickman Industries]**
 - b. **[Carr Corporation]**
 - c. **[Continental Metal Products Co. Inc.]**
 - d. **[Inner Space, a Solaire Medical Company]**
 - e. **[Inter Dyne Systems, Inc]**
 - f. **[Scientek, a brand of Spire Integrated Solutions]**
 - g. **[Skytron, LLC]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Blickman Industries]**
 - b. **[Carr Corporation]**
 - c. **[Continental Metal Products Co. Inc.]**
 - d. **[Inner Space, a Solaire Medical Company]**
 - e. **[Inter Dyne Systems, Inc]**
 - f. **[Scientek, a brand of Spire Integrated Solutions]**
 - g. **[Skytron, LLC]**
 - h. **<Insert manufacturer's name>**
- B. Specimen Pass-Through Cabinets: Construct of stainless steel as through-wall units with double-walled construction and smooth interior. Provide with double-pan flush doors with interlocking hardware that prevents each door from being opened when the other door is open. Provide with stainless steel continuous hinges complying with BHMA A156.9, Grade 1. Provide with removable, stainless steel spill tray and trim flanges **[for both faces][where indicated on Drawings]** .
- C. Warming Cabinets: Recessed units covered on back, top, and sides with **1-inch- (25-mm-)** thick insulation. Insulate double-pan door and equip with heat-resistant gasket. Provide with thermostatically controlled heating system to maintain temperature within **10 deg F (5.5 deg C)** of temperature setting that can be varied from **97 to 160 deg F (36 to 71 deg C)**.
1. Insulation: Semirigid, glass-fiber board insulation complying with ASTM C612, Type IA or Type IB.
 2. Equip units with **[fan-forced electric][steam]** heating system.
- D. Desk Units: Recessed units with sloped stainless steel writing surface, **[magnetic stainless steel][white marker board][tack board]** back panel, and built-in fluorescent light fixture.
1. Provide drawers under the writing surface.
 2. Provide keyboard drawer under the writing surface and provide drawers and space for desktop computer under keyboard drawer.
 - a. Provide **[rack][articulated arm]** for monitor over the writing surface.

2.6 STAINLESS STEEL WALL-MOUNTED SHELVES

- A. Stainless Steel Wall-Mounted Shelf: Fabricate from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness. Weld shop-made joints. Fold front edge [**up**][**down**] a minimum of **3/4 inch (19 mm)**; fold back edge up a minimum of **3 inches (75 mm)**. Provide integral stiffening brackets, formed by folding up ends a minimum of **3/4 inch (19 mm)** and by welding to upturned edges.
- B. Stainless Steel Sheet: ASTM A240/A240M, [**Type 304**][**Type 316L**] .

2.7 GLAZING

- A. Float Glass: Clear float glass complying with ASTM C1036, Type I, Class 1, Quality-Q3; not less than [**3.0 mm**][**4.0 mm**][**5.0 mm**][**6.0 mm**] thick.
- B. Tempered Glass: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.
- C. Laminated Glass: Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- D. Glass for Shelves: Clear tempered, ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; 6.0 mm thick; with exposed edges seamed before tempering.

2.8 PEGBOARDS

- A. Hardboard Pegboard: **1/4-inch- (6.4-mm-)** thick perforated hardboard, complying with ANSI A135.4, Class 1 tempered; with painted finish sealing faces, edges, and perimeter of holes.
- B. Stainless Steel Pegboard: Perforated stainless steel sheet, **0.050-inch (1.27-mm)** nominal thickness.
- C. Sheet-Steel Pegboard: Perforated steel sheet, **0.048-inch (1.21-mm)** nominal thickness, with powder-coated finish.

2.9 CASEWORK HARDWARE

- A. Provide healthcare casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Door Hinges: [**Stainless**][**Epoxy-coated**] steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide two hinges for doors **48 inches (1200 mm)** high or less, and provide three for doors more than **48 inches (1200 mm)** high.
- C. Hinged-Door and Drawer Pulls: Back-mounted pulls of [**solid aluminum, stainless steel, or chrome-plated brass**][**epoxy-coated steel**] . Provide two pulls for drawers more than **24 inches (600 mm)** wide.
 - 1. Design: [**Wire pulls**][**Rectangular loop pulls**][**Rectangular loop pulls with rounded corners**][**As selected from manufacturer's full range**][**As indicated**]<Insert description> .
 - 2. Overall Size: [**1 by 4-1/2 inches (25 by 114 mm)**][**1-1/4 by 4-1/2 inches (32 by 114 mm)**][**1-3/8 by 5-1/2 inches (35 by 140 mm)**][**As selected from manufacturer's full range**]<Insert

dimensions> .

- D. Sliding-Door Pulls: Recessed flush pulls of **[stainless steel or chrome plated][epoxy-coated steel]** .
 - 1. Design and Size: **[Round, 1-3/4 inches (45 mm) in diameter by 1/8 inch (3 mm) deep][Round, 1-3/4 inches (45 mm) in diameter by 3/16 inch (5 mm) deep][Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep][As selected from manufacturer's full range]<Insert requirements> .**
- E. Door Catches: **[Nylon-roller spring catches][Dual, self-aligning, permanent magnet catches]** .
Provide two catches on doors more than **48 inches (1200 mm)** high.
- F. Drawer Slides: Manufacturer's standard; complying with ANSI/BHMA A156.9.
- G. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately **1 by 2 inches (25 by 50 mm)**, attached with screws or rivets. **[Provide where indicated on Drawings.]**
- H. Locks: Cam or half-mortise type; brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, **[E07261,]** E07111, or E07021.
 - 1. Tumbler: **[Disc][Five pin]** .
 - 2. Lock Locations: Provide **[where indicated on Drawings][on drawers and doors]<Insert requirements> .**
 - 3. Keying: Key **[locks alike within each room, and key each room separately][each lock separately][locks as directed]** .
 - a. Master key for up to **[225][500]<Insert number>** key changes.
 - 4. Key Quantity: Minimum of **[two]<Insert number>** keys per lock.
 - 5. Master Key System: Key all locks to be operable by master key.
 - a. Master Keys: Provide **[two]<Insert number>** .
- I. Sliding-Door Hardware Sets: Healthcare casework manufacturer's standard, to suit type and size of sliding-door unit.

2.10 FABRICATION OF CASEWORK

- A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt- and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of **1/16 to 3/32 inch (1.5 to 2.4 mm)**.
- B. Metal Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.
- C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.
- D. Hinged Doors: Mortise doors for hinges and reinforce with angles welded inside inner pans or hollow-metal stiles at hinge edge.

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- E. Metal Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal.
- F. Metal Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.
- G. Shelf Supports: Provide clips, brackets, pilasters, or other means to support shelves from cabinet ends and to allow height of shelves to be adjusted in increments of not more than **2 inches (50 mm)**.
- H. Sloping Tops: Unless tops are concealed by other construction, provide sloping tops on cabinets with tops **60 inches (1524 mm)** or more above the finished floor. Slope tops 25 degrees or more and construct of same material and with same finish as cabinets.
- I. Toe Space: Unless casework is fully recessed, provide metal toe space, fully enclosed, **4 inches (100 mm)** high by **3 inches (75 mm)** deep, with no open gaps or pockets.
- J. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as casework and with hemmed or flanged edges.
- K. Trim Flanges: Formed metal trim fabricated from same material and with same finish as casework. Provide at perimeter of recessed cabinets.

2.11 FINISHES

- A. Enameled-Steel Finish:
 - 1. Surface Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
 - 2. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply healthcare casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of casework surface finish tests in SEFA 8 M. Acceptance level for chemical spot test to be no more than for Level 3 conditions.
 - b. Colors for Healthcare Casework Finish: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]** .
- B. Stainless Steel Finish: Grind and polish surfaces to produce uniform, directional-satin finish matching ASTM A480/A480M, No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of healthcare casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HEALTHCARE CASEWORK

- A. Install casework level, plumb, and true in line; shim as required using concealed shims. Where healthcare casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: **1/16 inch in 10 ft. (1.5 mm in 3 m).**
 - 2. Variation of Bottoms of Upper Cabinets from Level: **1/8 inch in 10 ft. (3 mm in 3 m).**
 - 3. Variation of Faces of Casework from a True Plane: **1/8 inch in 10 ft. (3 mm in 3 m).**
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): **1/32 inch (0.8 mm).**
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: **1/16 inch (1.5 mm).**
- B. Recessed Cabinets: Set cabinets in openings and fasten to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than **24 inches (600 mm)** o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- C. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than **16 inches (400 mm)** o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through the back, near the top, at not less than **16 inches (400 mm)** o.c. unless continuously hung from hanging strips.
- E. Install door and drawer hardware uniformly and precisely.
- F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF STAINLESS STEEL WALL-MOUNTED SHELVES

- A. Wall-Mounted Shelves: Fasten to supporting construction through upturned back edge at not less than **24 inches (600 mm)** o.c.
 - 1. For framed construction, fasten through wall or partition finishes directly to framing, blocking, or reinforcements.

3.4 CLEANING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish as approved by Architect.

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END OF SECTION 12 35 70 00



Task	Specification	Specification Description
12 35 70 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 35 70 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 35 70 00	12 30 00 00b	Metal Laboratory Casework
12 35 70 00	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 35 70 00	12 35 00 00a	Wood Laboratory Casework
12 35 70 13	01 11 19 00	No Specification Required
12 35 70 13	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 35 70 13	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 35 70 13	12 30 00 00b	Metal Laboratory Casework
12 35 70 13	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 35 70 13	12 35 00 00a	Wood Laboratory Casework
12 35 70 13	12 35 70 00	Healthcare Casework
12 35 70 19	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 35 70 19	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 35 70 19	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 35 70 19	12 35 00 00a	Wood Laboratory Casework
12 36 00 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 00 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 00 00	12 30 00 00b	Metal Laboratory Casework
12 36 00 00	12 35 70 00	Healthcare Casework
12 36 23 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 23 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 23 00	12 30 00 00b	Metal Laboratory Casework
12 36 23 00	12 35 70 00	Healthcare Casework



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SECTION 12 36 23 13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.
2. Accessories.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for cantilever supports.
2. Section 224100 "Residential Plumbing Fixtures" for non-integral sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachments to other work.
2. Locations and details of joints.
3. Locations and sizes of cutouts and holes for items installed in countertop.
4. Apply **[AWI's Quality Certification][WI's Certified Compliance]** Program label to Shop Drawings.

C. Samples for Initial Selection: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

D. Samples for Verification:

1. Plastic Laminates: For each type, color, pattern, and surface finish required, **[8 by 10 inches (200 by 250 mm)][12 by 12 inches (300 by 300 mm)]** in size.
2. Wood-Grain Plastic Laminates: For each type, color, pattern, and surface finish required, **[12 by 24 inches (300 by 600 mm)][24 by 24 inches (600 by 600 mm)]** in size.
3. Fabrication Sample: For each type and profile of countertop required, provide one sample applied to core material with specified edge material applied to one edge.

E. Sustainable Design Submittals:

1. Laboratory Test Reports: For laminating adhesives, indicating compliance with requirements for low-emitting materials.
2. Product Data: For laminating adhesives, indicating that product contains no urea formaldehyde.
3. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertop and backsplashes.
- B. Product Certificates: For the following:
 - 1. Composite wood products.
 - 2. High-pressure decorative laminate.
 - 3. Chemical-resistant, high-pressure decorative laminate.
- C. Quality Standard Compliance Certificates: **[AWI's Quality Certification Program][WI's Certified Compliance Program]**.
- D. Qualification Statements: For **[Installer][Fabricator]**.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Shop Certification: **[AWI's Quality Certification Program accredited participant][WI's Certified Compliance Program licensee]**.
- B. Installer Qualifications: **[Fabricator of products][AWI's Quality Certification Program accredited participant][WI's Certified Compliance Program licensee]**.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.6 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between **60 and 90 deg F (16 and 32 deg C)** and relative humidity between **[25 and 55][43 and 70][20 and 50]<Insert numbers>** percent during the remainder of the construction period.
- C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop

Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Plastic-Laminate-Clad Countertop Type :
- B. Fabricators: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **<Insert, in separate subparagraphs, names and contact information for preapproved woodworking firms>.**
- C. Quality Standard: Unless otherwise indicated, comply with **[ANSI/AWI 1236][NAAWS]** for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
1. Provide inspections of fabrication and installation together with labels and certificates from **[AWI][WI]** certification program indicating that countertops comply with requirements of grade specified.
 2. The Contract Documents contain requirements that are more stringent than that of the referenced quality standard. Comply with requirements of the Contract Documents in addition to those of referenced quality standard.
- D. Grade: **[Premium][Custom][Economy][Match related casework]**.
1. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
- E. Certified Wood: Verify product is certified as "FSC Pure"[or "**FSC Mixed Credit**"] in accordance with FSC STD-01-001 and FSC STD-40-004.
- F. Certified Wood: Verify product is labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- G. Certified Wood: Verify product is certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- H. High-Pressure Decorative Laminate: ISO 4586-3, **[Grade HGS][Grade HGF][Grade HGP]**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ABET Inc.]
- b. [Formica Corporation]
- c. [Laminart LLC]
- d. [Nevamar Company, LLC]
- e. [Pionite; a Panolam Industries International, Inc. brand]
- f. [Wilsonart LLC]
- g. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ABET Inc.]
- b. [Formica Corporation]
- c. [Laminart LLC]
- d. [Nevamar Company, LLC]
- e. [Pionite; a Panolam Industries International, Inc. brand]
- f. [Wilsonart LLC]
- g. <Insert manufacturer's name>

- I. Chemical-Resistant, High-Pressure Decorative Laminate: ISO 4586-3, Grade HGP, and as follows:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Formica Corporation]
- b. [Pionite; a Panolam Industries International, Inc. brand]
- c. [Wilsonart LLC]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Formica Corporation]
- b. [Pionite; a Panolam Industries International, Inc. brand]
- c. [Wilsonart LLC]
- d. <Insert manufacturer's name>

3. Physical Properties: Minimum acceptable chemical-resistance performance to result in no more than four (4) Level 3 conditions when tested with indicated reagents in accordance with SEFA 3.

- a. <Insert chemical reagent>.

- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

- 1. As indicated by manufacturer's designations.
- 2. Match Architect's sample.
- 3. As selected by Architect from manufacturer's full range in the following categories:
 - a. Solid colors, [gloss][matte] finish.
 - b. Solid colors with core same color as surface, [gloss][matte] finish.

- c. Wood grains, **[gloss][matte]** finish with grain running parallel to length of countertop.
- d. Patterns, **[gloss][matte]** finish.
- K. Edge Treatment: **[Same as laminate cladding on horizontal surfaces][PVC edging][ABS edging][As indicated on Drawings]**.
- L. Core Material: **[Fire rated][Particleboard or MDF][Particleboard][MDF][Veneer-core plywood][As selected by fabricator to comply with quality standard]<Insert requirements>**.
- M. Core Material at Sinks: **[Particleboard made with exterior glue][MDF made with exterior glue][or][veneer-core plywood made with Type II adhesive]<Insert requirements>**.
- N. Core Thickness: **[3/4 inch (19 mm)][1-1/8 inches (29 mm)]**.
 - 1. Build up countertop thickness to **1-1/2 inches (38 mm)** at front, back, and ends with additional layers of core material laminated to top.
 - 2. Provide drip groove **[1/8 by 1/8 inch (3.2 and 3.4 mm) set back 3/8 inch (9.5 mm)]<Insert groove size and location>** from front edge of countertop.
- O. Backer Sheet: Provide plastic-laminate backer sheet, ISO 4586-3, grade to match exposed surface, on underside of countertop substrate.
- P. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
- B. Composite Panel Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
 - 1. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
 - 2. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 - 3. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
 - 4. Medium-Density Fiberboard (MDF): ANSI A208.2[, **MR 10**][, **MR 30**][, **MR 50**].
 - a. **[Grade 130][Grade 155][Grade 130 or better; complying with performance requirements specified]**.
 - 5. Particleboard: ANSI A208.1[, **MR 10**][, **MR 30**][, **MR 50**].
 - a. **[Grade M-2][Grade M3][Grade M-2 or better; complying with performance requirements specified]**.

6. Veneer-Core Hardwood Plywood: ANSI/HPVA HP-1.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.
 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than **10.5 ft (3.2 m)** beyond the centerline of the burners at any time during the test.
 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less when tested in accordance with ASTM E84.
 1. For panels **3/4 inch (19 mm)** thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, **1600 psi (11 MPa)**; modulus of elasticity, **300,000 psi (2070 MPa)**; internal bond, **80 psi (550 kPa)**; and screw-holding capacity on face and edge, **250 and 225 lbf (1100 and 1000 N)**, respectively.
 2. For panels **13/16 to 1-1/4 inches (20 to 32 mm)** thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, **1300 psi (9 MPa)**; modulus of elasticity, **250,000 psi (1720 MPa)**; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, **250 and 175 lbf (1100 and 780 N)**, respectively.
- D. Fire-Retardant MDF: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less in accordance with ASTM E84.

2.4 ACCESSORIES

- A. Grommets:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Doug Mockett & Company, Inc.]**
 - b. **[Hafele America Co.]**

- c. **[W.W. Grainger, Inc.]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Doug Mockett & Company, Inc.]**
 - b. **[Hafele America Co.]**
 - c. **[W.W. Grainger, Inc.]**
 - d. **<Insert manufacturer's name>**
- 3. Wire-Management Grommets: Circular, grommets and matching caps with slot for wire passage.
 - a. Finish: **[Metal][Molded plastic]**.
 - b. Outside Diameter: **[1-1/4 inches (32 mm)][2 inches (51 mm)]<Insert dimension>**.
 - c. Color: **[Brushed, nickel plated][Polished, chrome plated][Black, epoxy coated][Brown][Black]<Insert finish>**.
- 4. Power/Data Grommets: UL-listed **[recessed][pop-up]** grommet.
 - a. Power Outlets: **[2][3][5]**.
 - b. USB Charger: **[Type A][Type B][1 Dual]<Insert type>**.
- 5. Paper-Slot Grommet: **[12 inches (305 mm)][17 inches (432 mm)]** long by **1-3/4 inches (45 mm)** wide by **1 inch (25 mm)** deep; molded-plastic, paper-slot liner with 1/4-inch (6.4-mm) lip.
 - a. Color: **[Brown][Black]<Insert color>**.
- B. Support Brackets:
 - 1. Countertop: **<Insert type or drawing designation>**.
 - a. Type: **[Hidden][Front mount][Decorative]**.
 - b. Style: **<Insert manufacturer and model number>**.
 - c. Material: **[Steel][Stainless steel][Bronze][Iron]**.
 - d. Color: **[Black][White]** powder coat.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives: Use adhesives that comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Adhesive for Bonding Plastic Laminate: **[Type I, waterproof type][Type II water-resistant type]** as selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive **[or adhesive specified above for faces]**.
- D. Installation Adhesive: Manufacturer's standard product that is recommended for application indicated.
 - 1. Verify adhesives have a VOC content of **[70]<Insert number>** g/L or less.

2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of **1 inch (25 mm)** over base cabinets. Ease edges to radius indicated for the following:
 1. Solid-Wood (Lumber) Members: **1/16 inch (1.5 mm)** unless otherwise indicated.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of dates and times countertop fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.3 INSTALLATION OF PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where indicated on Shop Drawings.
 - 1. Secure field joints in countertops with concealed clamping devices located within **6 inches (150 mm)** of front and back edges and at intervals not exceeding **24 inches (600 mm)**. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical-treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- E. Countertop Installation:
 - 1. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 3. Anchor wall cleating necessary for proper setting for countertops not supported by casework.
 - 4. Install countertops level and true in line. Use concealed shims as required to maintain not more than **1/8-inch-in-96-inch (3-mm-in-2400-mm)** variation from a straight, level plane.
 - 5. Secure backsplashes **[to tops with concealed metal brackets at 16 inches (400 mm) o.c.][and][to walls with adhesive]**.
 - 6. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through **[AWI's Quality Certification Program][WI's Certified Compliance Program]** certifying that woodwork, including installation, complies with requirements of the referenced standard for the specified grade.

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1. Inspection entity is to prepare and submit report of inspection.

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where impossible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces.
- C. Protection: Provide kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of **48 inches (1220 mm)** o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 23 13



Task	Specification	Specification Description
12 36 23 13	06 40 00 00a	Interior Architectural Woodwork
12 36 23 13	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 23 13	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 23 13	12 30 00 00b	Metal Laboratory Casework
12 36 23 13	12 35 70 00	Healthcare Casework



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SECTION 12 36 53 00 - METAL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel countertops.
2. Stainless steel integral sinks.

B. Related Requirements:

1. Section 123570 "Healthcare Casework" for base cabinets.
2. Section 224300 "Healthcare Plumbing Fixtures" for plumbing fittings and installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For metal fabrications.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. For countertops, show locations and sizes of cutouts and holes for items installed in metal countertops.

C. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

1.3 DELIVERY, STORAGE, AND HANDLING

- A.** Deliver products only after casework and supports on which they will be installed have been completed in installation areas.
- B.** Keep finished surfaces of products covered with polyethylene film or other protective covering during handling and installation.

1.4 FIELD CONDITIONS

- A.** Field Measurements: Where products are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B.** Established Dimensions: Where products are indicated to fit to other construction, establish dimensions for areas where products are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS**2.1 STAINLESS STEEL FABRICATIONS**

- A. Stainless Steel Countertops **<Insert drawing designation>** : Fabricate from **0.062-inch- (1.59-mm-)** thick, stainless steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of **1 inch (25 mm)** over the base cabinets.
1. Joints: Fabricate countertops **[without field-made joints]****[in sections for joining in field, with joints at locations indicated on Drawings]** .
 2. Weld shop-made joints.
 3. Sound deaden the undersurface with heavy-build mastic coating.
 4. Extend the top down to provide a **1-inch- (25-mm-)** thick edge with a **1/2-inch (12.7-mm)** return flange.
 5. Form the backsplash coved to and integral with top surface, with a **1/2-inch- (12.7-mm-)** thick top edge and **1/2-inch (12.7-mm)** return flange.
 6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
- B. Stainless Steel Integral Sinks **<Insert drawing designation>** : Provide sinks within stainless steel countertops at locations indicated on Drawings. Fabricate from stainless steel sheet, not less than **0.050-inch (1.27-mm)** nominal thickness. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints. Weld shop-made joints within sink and between sink and countertop.
1. Provide sizes indicated on Drawings.
 2. Provide double-wall construction for sink partitions with top edge rounded to at least **1/2-inch (13-mm)** diameter.
 3. Factory punch holes for fittings.
 4. Provide sinks with stainless steel strainers and tailpieces.
 5. Factory weld sinks to stainless steel countertops to provide one integral unit.
 6. Apply **1/8-inch- (3-mm-)** thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.2 MATERIALS

- A. Stainless Steel Sheet: ASTM A240/A240M, **[Type 304][Type 316L]** .
- B. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and the following:
1. Mildew-Resistant Joint Sealant: **[Mildew resistant, single component, nonsag, neutral curing, silicone][Mildew resistant, single component, nonsag, acid curing, silicone]<Insert joint sealant>** .
 2. Joint Sealant: **[Latex][Single component, nonsag, neutral curing, silicone; Class 25]<Insert joint sealant>** .
 3. Color: **[Clear][As selected by Architect from manufacturer's full range]** .
 4. Product Data: Verify architectural sealant has a VOC content of 250 g/L or less.

2.3 STAINLESS STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no

evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF STAINLESS STEEL COUNTERTOPS

- A. Secure countertops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- B. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- C. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- D. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended in writing by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where indicated on Shop Drawings.
- E. Seal junctures of countertops, splashes, and walls with sealant for countertops.

3.3 CLEANING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces. Remove and replace damaged products or touch up and refinish damaged areas to match original factory finish, as approved by Architect.

3.4 PROTECTION

- A. Protection: Provide **6-mil (0.15-mm)** plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of **48 inches (1220 mm)** o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 53 00



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Task	Specification	Specification Description
12 36 53 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 53 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 53 00	12 30 00 00b	Metal Laboratory Casework
12 36 53 00	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 36 53 00	12 35 00 00a	Wood Laboratory Casework
12 36 53 00	12 35 70 00	Healthcare Casework



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SECTION 12 36 61 00 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cultured marble countertops.
2. Solid surface material countertops.
3. Quartz agglomerate countertops.
4. Accessories.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for cantilever supports.
2. Section 224100 "Residential Plumbing Fixtures" and Section 224200 "Commercial Plumbing Fixtures" for non-integral sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of countertop material[**and sink**].

B. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachment to other work.
2. Locations and details of joints.
3. Locations, quantity, and type of supports/brackets.
4. Direction of directional pattern, if any.
5. Locations and sizes of cutouts and holes for items installed in countertop.
6. Apply **[AWI's Quality Certification][WI's Certified Compliance]** Program label to Shop Drawings.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification:

1. Countertop material, **6 inches (152 mm)** square.
2. One full-size countertop, with front edge[**and backsplash**], **8 by 10 inches (203 by 254 mm)**, of construction and in configuration specified.

E. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertops or backsplashes.

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- B. Qualification Statements: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include product data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.6 MOCKUPS

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of countertops by field measurements[**after base cabinets are installed but**] before countertop fabrication is complete and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work..

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Quality Standard: Unless otherwise indicated, comply with **[ANSI/AWI 1236][NAAWS]** for grades of simulated stone countertops indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from **[AWI][WI]** certification program indicating that countertops comply with requirements of grade specified.
2. The Contract Documents contain more stringent requirements than that of the referenced quality standard. Comply with requirements of the Contract Documents in addition to those of referenced quality standard.

2.2 CULTURED MARBLE COUNTERTOPS

A. Cultured Marble Countertop Type :

1. Grade: **[Premium][Custom][Economy][Match related casework]**.

B. Cultured Marble Material: Gel-coated solid fabrication of filled plastic resin complying with CSA B34.5/IAPMA Z124.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Marblecraft Company, Inc.]**
 - b. **[MarCraft, Inc.]**
 - c. **[Rynone Manufacturing Corp.]**
 - d. **[Tiffany Marble Inc.]**
 - e. **[Wolf Home Products]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Marblecraft Company, Inc.]**
 - b. **[MarCraft, Inc.]**
 - c. **[Rynone Manufacturing Corp.]**
 - d. **[Tiffany Marble Inc.]**
 - e. **[Wolf Home Products]**
 - f. **<Insert manufacturer's name>**
3. Colors and Patterns: **[As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range]**.
4. Countertop:
 - a. Thickness: **3/4 inch (19 mm)**.
 - b. Exposed Edge Treatment: **[Bevel][Ogee][Radius][As selected by Architect from manufacturer's full range]<Insert style>**.
 - c. Provide drip groove **[1/8 inch (3.2 mm) by 1/8 inch (3.2 mm) set back 3/8 inch (9.5 mm)]<Insert groove size and location>** from front edge of countertop.
 - d. Backsplash: **[Integral coved][Detached straight]**.
 - 1) Height: **[4 inches (101.6 mm)]<Insert height>**.
 - 2) Thickness: **[1/2 inch (12.7 mm)][Matching countertop]**.
 - e. End Splash: **[Matching backsplash][None]**.

5. Sink Bowls:

- a. [Integral][Top mounted][Separate unit for under-counter mounting].
- b. Material: [PMMA][Acrylic][Composite][Enameled cast-iron][Enameled steel][Solid surface][Stainless steel][Vitreous china]<Insert type>.
- c. Shape: [Oval][Rectangle]<Insert type>.
- d. Color: [White][Match countertop]<Insert color>.

2.3 SOLID SURFACE MATERIAL COUNTERTOPS

A. Solid Surface Countertop Type :

- 1. Grade: [Premium][Custom][Economy][Match related casework].

B. Solid Surface Material: Homogeneous fabrication of mineral fillers and pigments bound together with a matrix of polymers and resins, complying with ISFA 2-01.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Affinity Surfaces; a brand of Domain Industries, Inc.]
 - b. [Avonite Surfaces; a Brand of Aristech Surfaces LLC]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [Durasein Solid Surface; a brand of Relang International, LLC]
 - e. [Formica Corporation]
 - f. [LG Hausys, Ltd.]
 - g. [Lotte Chemical Co., LTD]
 - h. [Meganite Inc.]
 - i. [Swan Surfaces LLC (Swanstone)]
 - j. [Transolid]
 - k. [Wilsonart LLC]
 - l. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Affinity Surfaces; a brand of Domain Industries, Inc.]
 - b. [Avonite Surfaces; a Brand of Aristech Surfaces LLC]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [Durasein Solid Surface; a brand of Relang International, LLC]
 - e. [Formica Corporation]
 - f. [LG Hausys, Ltd.]
 - g. [Lotte Chemical Co., LTD]
 - h. [Meganite Inc.]
 - i. [Swan Surfaces LLC (Swanstone)]
 - j. [Transolid]
 - k. [Wilsonart LLC]
 - l. <Insert manufacturer's name>
- 3. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].

4. Countertop:
 - a. Type: **[Standard][Special Purpose][Veneer]**.
 - b. Thickness:
 - 1) **[1/2-inch- (12.7-mm-)][3/4-inch- (19-mm-)]** thick, solid surface material **[with front edge built up with same material]**.
 - c. Exposed Edge Treatment: **[Bevel][Ogee][Radius][As selected by Architect from manufacturer's full range]<Insert style>**.
 - d. Provide drip groove **[1/8 inch (3.2 mm) by 1/8 inch (3.2 mm) set back 3/8 inch (9.5 mm)]<Insert groove size and location>** from front edge of countertop.
 - e. Backsplash: **[Integral coved][Detached straight]**.
 - 1) Height: **[4 inches (101.6 mm)]<Insert height>**.
 - 2) Thickness: **[1/2 inch (12.7 mm)][Matching countertop]**.
 - f. End Splash: **[Matching backsplash][None]**.
5. Sink Bowls:
 - a. **[Integral][Top Mounted][Separate unit for under-counter mounting]**.
 - b. Material: **[PMMA][Acrylic][Composite][Enameled cast iron][Enameled steel][Solid surface][Stainless steel][Vitreous china]<Insert type>**.
 - c. Shape: **[Oval][Rectangle]<Insert type>**.
 - d. Color: **[White][Match countertop]<Insert color>**.

2.4 QUARTZ AGGLOMERATE COUNTERTOPS

- A. Quartz Agglomerate Countertop Type :
 1. Grade: **[Premium][Custom][Economy][Match related casework]**.
- B. Quartz Agglomerate Material: Homogenous fabrication of natural quartz aggregates and pigments bound together with a matrix of polymers and resins, complying with ISFA 3-01.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Cambria]**
 - b. **[Cosentino North America; C&C North America, Inc.]**
 - c. **[DuPont; DuPont de Nemours, Inc.]**
 - d. **[Durasein Solid Surface; a brand of Relang International, LLC]**
 - e. **[Lotte Chemical Co., LTD]**
 - f. **[TechniStone; Wilsonart LLC]**
 - g. **[Vicostone USA]**
 - h. **[Wilsonart LLC]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Cambria]
 - b. [Cosentino North America; C&C North America, Inc.]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [Durasein Solid Surface; a brand of Relang International, LLC]
 - e. [Lotte Chemical Co., LTD]
 - f. [TechniStone; Wilsonart LLC]
 - g. [Vicostone USA]
 - h. [Wilsonart LLC]
 - i. <Insert manufacturer's name>
3. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
4. Countertop:
 - a. Thickness: [0.787 inch (2 cm)][1.18 inch (3 cm)].
 - b. Exposed Edge Treatment: [Chamfer][Eased][Bullnose][As selected by Architect from manufacturer's full range]<Insert style>.
 - c. Provide drip groove [1/8 inch (3.2 mm) by 1/8 inch (3.2 mm) set back 3/8 inch (9.5 mm)]<Insert groove size and location> from front edge of countertop.
 - d. Backsplash: [Integral coved][Detached straight].
 - 1) Height: [4 inches (101.6 mm)]<Insert height>.
 - e. End Splash: [Matching backsplash][None].
5. Sink Bowls:
 - a. [Integral][Top mounted][Separate unit for under-counter mounting].
 - b. Material: [PMMA][Acrylic][Composite][Enameled cast iron][Enameled steel][Solid surface][Stainless steel][Vitreous china]<Insert type>.
 - c. Shape: [Oval][Rectangle]<Insert type>.
 - d. Color: [White][Match countertop]<Insert color>.

2.5 ACCESSORIES

A. Grommets:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Doug Mockett & Company, Inc.]
 - b. [Hafele America Co.]
 - c. [W.W. Grainger, Inc.]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Doug Mockett & Company, Inc.]
 - b. [Hafele America Co.]
 - c. [W.W. Grainger, Inc.]

- d. <Insert manufacturer's name>
3. Wire-Management Grommets: Circular, grommets and matching caps with slot for wire passage.
 - a. Finish: **[Metal][Molded plastic]**.
 - b. Outside Diameter: **[1-1/4 inches (32 mm)][2 inches (51 mm)]<Insert dimension>**.
 - c. Color: **[Brushed, nickel plated][Polished, chrome plated][Black, epoxy coated][Brown][Black]<Insert finish>**.
4. Power/Data Grommets: UL-listed **[recessed][pop-up]** grommet.
 - a. Power Outlets: **[Two][Three][Five]**.
 - b. USB Charger: **[Type A][Type B][1 dual]<Insert type>**.
5. Paper Slot Grommet: **[12 inches (305 mm)][17 inches (432 mm)]** long by **1-3/4 inches (45 mm)** wide by **1 inch (25 mm)** deep; molded-plastic, paper-slot liner with **1/4-inch (6.4-mm)** lip.
 - a. Color: **[Brown][Black]<Insert color>**.
- B. Support Brackets:
 1. Countertop <Insert type or drawing designation>:
 - a. Type: **[Hidden][Front mount][Decorative]**.
 - b. Style: **<Insert manufacturer and model number>**
 - c. Material: **[Steel][Stainless steel][Bronze][Iron]**.
 - d. Color: **[Black][White]** powder coat.

2.6 FABRICATION

- A. Fabricate countertops in sizes and shapes required to comply with requirements indicated.
- B. Fabricate tops with shop-applied edges[**and backsplashes**] unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 1. Fabricate with loose backsplashes for field assembly.
 2. Install integral sink bowls in countertops in the shop.
- C. Joints:
 1. Fabricate countertops without joints.
 2. Fabricate countertops in sections for joining in field[, **with joints at locations indicated**].
 - a. Joint Locations: Not within **18 inches (450 mm)** of a sink or cooktop and not where a countertop section less than **36 inches (900 mm)** long would result, unless unavoidable.
 - b. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints[**where indicated**]. Make width of cuts slightly more than thickness of splines to provide snug fit.[**Provide at least three splines in each joint.**]
- D. Cutouts and Holes:
 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures[**in shop**] using template or pattern

furnished by fixture manufacturer. Form cutouts to smooth, even curves.

- a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting **3/16 inch (5 mm)** into fixture opening.
 - b. Provide vertical edges, rounded to **3/8-inch (9.5-mm)** radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting **3/16 inch (5 mm)** into fixture opening.
 - c. Provide **3/4-inch (19-mm)** full bullnose edges projecting **3/8 inch (9.5 mm)** into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill countertops in shop for grommets, plumbing fittings, undercounter soap dispensers, and similar items.
 4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.7 INSTALLATION MATERIALS

- A. Particleboard: ANSI A208.1, [**Grade M-2**][**Grade M-2-Exterior Glue**].
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
 1. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.
 2. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
 3. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- C. Adhesive: Product recommended by manufacturer.
 1. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- D. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.3 INSTALLATION OF SIMULATED STONE COUNTERTOPS

- A. Grade: Install countertops to comply with specified grade.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts not finished in the shop. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- C. Countertop Installation:
 - 1. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 3. Anchor wall cleating necessary for proper setting for countertops not supported by casework.
 - 4. Install countertops level to a tolerance of **1/8 inch in 8 ft. (3.2 mm in 2.4 m), 1/4 inch (6.4 mm)** maximum. Do not exceed **1/64-inch (0.4-mm)** difference between planes of adjacent units.
 - 5. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 6. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
 - 7. Secure countertops to subtops with adhesive according to manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 8. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - a. Install metal splines in kerfs in countertop edges at joints[**where indicated**]. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are

- drawn into position.
- b. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- 9. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
 - 10. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
 - 11. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls. Comply with Section 079200 "Joint Sealants."

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces.
- C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of **48 inches (1220 mm)** o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 61 00



Task	Specification	Specification Description
12 36 61 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 61 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 61 00	12 30 00 00b	Metal Laboratory Casework
12 36 61 00	12 35 70 00	Healthcare Casework
12 36 61 16	06 40 00 00a	Interior Architectural Woodwork
12 36 61 16	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 61 16	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 61 16	12 30 00 00b	Metal Laboratory Casework
12 36 61 16	12 35 70 00	Healthcare Casework
12 36 61 16	12 31 16 00	Stone Countertops
12 36 61 16	12 36 61 00	Simulated Stone Countertops
12 36 61 19	06 40 00 00a	Interior Architectural Woodwork
12 36 61 19	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 61 19	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework
12 36 61 19	12 30 00 00b	Metal Laboratory Casework
12 36 61 19	12 35 70 00	Healthcare Casework
12 36 61 19	12 31 16 00	Stone Countertops
12 36 61 19	12 36 61 00	Simulated Stone Countertops
12 36 91 00	12 30 00 00	Manufactured Wood-Veneer-Faced Casework
12 36 91 00	12 30 00 00a	Manufactured Plastic-Laminate-Clad Casework



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SECTION 12 48 13 00 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roll-up rail mats.
2. Resilient entrance mats.
3. Resilient-tile entrance mats.
4. **[Recessed][Surface-mounted]** frames.

B. Related Requirements:

1. Section 124816 "Entrance Floor Grilles" for rigid floor grilles and frames.

1.2 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

B. Shop Drawings:

1. Items penetrating floor mats and frames, including door control devices.
2. Divisions between mat sections.
3. Perimeter floor **[moldings][frames]**.
4. Custom Graphics: Scale drawing indicating colors.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat: Assembled sections of floor mat.
2. Tread Rail: Sample of each type and color.
3. Frame Members: Sample of each type and color.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for

storage and identified with labels describing contents.

1. Resilient-Tile Entrance Mats: Full-size tile units equal to [2]<Insert number> percent of amount installed, but no fewer than [10]<Insert number> units.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
 1. Uniform floor load of [300 lbf/sq. ft. (14.36 kN/sq. m)]<Insert value>.
 2. Wheel load of [350 lb (159 kg)]<Insert value> per wheel.
- B. Accessibility Standard: Comply with applicable provisions in [the DOJ's "2010 ADA Standards for Accessible Design"]&[ICC A117.1]<Insert regulation>.

2.2 ROLL-UP RAIL MATS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Amarco Products]
 2. [Babcock-Davis]
 3. [Balco; a CSW Industrials Company]
 4. [Construction Specialties, Inc.]
 5. [Durable Corporation]
 6. [Forbo Flooring Systems]
 7. [JL Industries; Activar Construction Products Group, Inc.]
 8. [K.N. Crowder Mfg. Inc]
 9. [Kadee Industries, Inc]
 10. [Matco International]
 11. [Mats Inc.]
 12. [Matter Surfaces]
 13. [Milliken & Company]
 14. [Nystrom, Inc.]
 15. [Pawling Corporation]
 16. [ProSpec; H.B. Fuller Construction Products Inc.]
 17. [Reese Enterprises, Inc]
 18. [The R.C. Musson Rubber Co.]
 19. [van Gelder, Inc]
 20. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Amarco Products]
 2. [Babcock-Davis]
 3. [Balco; a CSW Industrials Company]
 4. [Construction Specialties, Inc.]

5. [Durable Corporation]
6. [Forbo Flooring Systems]
7. [JL Industries; Activar Construction Products Group, Inc.]
8. [K.N. Crowder Mfg. Inc]
9. [Kadee Industries, Inc]
10. [Matco International]
11. [Mats Inc.]
12. [Matter Surfaces]
13. [Milliken & Company]
14. [Nystrom, Inc.]
15. [Pawling Corporation]
16. [ProSpec; H.B. Fuller Construction Products Inc.]
17. [Reese Enterprises, Inc]
18. [The R.C. Musson Rubber Co.]
19. [van Gelder, Inc]
20. <Insert manufacturer's name>

- C. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails [1-1/2 inches (38 mm)][2 inches (50 mm)]<Insert dimension> wide by 3/8 inch (9.5 mm) thick, sitting on continuous vinyl cushions.

1. Tread Inserts: [Plain serrated aluminum treads][Textured-surface, resilient vinyl][Ribbed-design-surface, resilient vinyl][Mineral abrasive particles bonded to or embedded in vinyl][Aluminum-oxide or silicon-carbide grit in epoxy matrix][1/4-inch- (6.4-mm-) high, 28-oz./sq. yd. (950-g/sq. m) weight, level-cut, nylon-pile, fusion-bonded carpet]<Insert tread inserts>.
2. Colors, Textures, and Patterns of Inserts: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
3. Rail Color: [Mill finish][Clear][Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities].
4. Hinges: [Plastic][Aluminum].
5. Mat Size: [As indicated]<Insert size>.

- D. Roll-up, Vinyl-Rail Hinged Mats: Vinyl-acrylic tread rails [1-1/2 inches (38 mm)][2 inches (50 mm)]<Insert dimension> wide by 3/8 inch (9.5 mm) thick, with slotted or perforated hinges.

1. Tread Inserts: [Textured-surface, resilient vinyl][Ribbed-design-surface, resilient vinyl][Mineral abrasive particles bonded to or embedded in vinyl][Aluminum-oxide or silicon-carbide grit in epoxy matrix][1/4-inch- (6.4-mm-) high, 28-oz./sq. yd. (950-g/sq. m) weight, level-cut, nylon-pile, fusion-bonded carpet]<Insert tread inserts>.
2. Colors, Textures, and Patterns of Inserts: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
3. Rail Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
4. Hinges: [Vinyl][Aluminum].
5. Mat Size: [As indicated]<Insert size>.

2.3 RESILIENT ENTRANCE MATS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Amarco Products]
2. [American Floor Mats]
3. [American Floor Products Company, Inc]
4. [Babcock-Davis]
5. [Cactus Mat Mfg. Co.]
6. [Consolidated Plastics Company, Inc]
7. [Construction Specialties, Inc.]
8. [Durable Corporation]
9. [Entrance Inc]
10. [Forbo Flooring Systems]
11. [JL Industries; Activar Construction Products Group, Inc.]
12. [K.N. Crowder Mfg. Inc]
13. [Kadee Industries, Inc]
14. [Matco International]
15. [Mats Inc.]
16. [Matter Surfaces]
17. [Milliken & Company]
18. [Pawling Corporation]
19. [ProSpec; H.B. Fuller Construction Products Inc.]
20. [Reese Enterprises, Inc]
21. [SBEMCO Matting By Design]
22. [The R.C. Musson Rubber Co.]
23. [van Gelder, Inc]
24. [Wearwell, Inc]
25. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Amarco Products]
2. [American Floor Mats]
3. [American Floor Products Company, Inc]
4. [Babcock-Davis]
5. [Cactus Mat Mfg. Co.]
6. [Consolidated Plastics Company, Inc]
7. [Construction Specialties, Inc.]
8. [Durable Corporation]
9. [Entrance Inc]
10. [Forbo Flooring Systems]
11. [JL Industries; Activar Construction Products Group, Inc.]
12. [K.N. Crowder Mfg. Inc]
13. [Kadee Industries, Inc]
14. [Matco International]
15. [Mats Inc.]
16. [Matter Surfaces]
17. [Milliken & Company]
18. [Pawling Corporation]
19. [ProSpec; H.B. Fuller Construction Products Inc.]
20. [Reese Enterprises, Inc]
21. [SBEMCO Matting By Design]
22. [The R.C. Musson Rubber Co.]
23. [van Gelder, Inc]
24. [Wearwell, Inc]
25. <Insert manufacturer's name>

- C. Resilient Link Mats: Reversible [vinyl][rubber][rubber-tire] link mats, [3/8 inch (9.5 mm)][or][7/16 inch (11 mm)] thick, with [galvanized-spring][stainless]-steel wire link rods, vulcanized edge-nosing trim, steel-reinforced end trim, and links consisting of rectangular units or continuous strips in a [heel-proof, solid-weave pattern with no openings between links][heel-proof, close-weave pattern with openings between links not exceeding 1/8 inch (3.2 mm) wide by 1 inch (25.4 mm) long][open-weave pattern].
1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
 2. Mat Size: [As indicated]<Insert size>.
- D. [Rubber][or][Vinyl] Mats: [1/4-inch- (6.4-mm-)][3/8-inch- (9.5-mm-)][7/16-inch- (11-mm-)][1/2-inch- (13-mm-)]<Insert dimension> thick mats; with [square edges for recessed installations][beveled edges for surface applications] and with [solid-sheet (no perforations) style][perforated style, 1/4-inch (6.4-mm) diameter on standard spacing][perforated style, 3/16 by 3/4 inch (5 by 19 mm) on standard spacing], [standard pyramid design][standard wide-wale corrugated][hi-rib, narrow-wale corrugated] top profile, and [low-rib, narrow-wale corrugated][standard knob-base][flat-base] bottom surface.
1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
 2. Mat Size: [As indicated]<Insert size>.
- E. Cocoa Mats: Constructed from cocoa fiber yarn permanently bonded to PVC backing for dimensional stability and resistance to shedding; [5/8- to 3/4-inch (16- to 19-mm) overall thickness; 1.5-lb/sq. ft. (7.3-kg/sq. m)][1-inch (25.4-mm) overall thickness; 2.0-lb/sq. ft. (10-kg/sq. m)][1-1/4-inch (32-mm) overall thickness; 2.5-lb/sq. ft. (12-kg/sq. m)] weight.
1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
 2. Mat Size: [As indicated]<Insert size>.
- F. Rubber-Tire Mats: Units of edge-grain-laminated and chenille-buffed, rubber-tire wall cuts; bonded to sheet rubber or other durable flexible backing sheet to form 3/8- to 7/16-inch- (9.5- to 11-mm-) thick, 12-inch- (300-mm-) wide, continuous linear strip up to 25 feet (7.6 m) long.
1. Mat Size: [As indicated]<Insert size>.
- G. Carpet-Type Mats: [Nylon][Polypropylene][Olefin][Polyester] carpet bonded to 1/8- to 1/4-inch- (3.2- to 6.4-mm-) thick, flexible vinyl backing to form mats 3/8 or 7/16 inch (9.5 or 11 mm) thick with nonraveling edges.
1. Colors, Textures, and Patterns: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
 2. Mat Size: [As indicated]<Insert size>.
- H. Loop Filament Mats: Loop filament vinyl material [3/8 inch (9.5 mm)][1/2 inch (13 mm)] thick, with [solid vinyl][foam] sheet backing and with built-in chemical agents to reduce fungus and mildew.
1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].
 2. Mat Size: [As indicated]<Insert size>.
- I. Graphics: Custom inlaid or woven-in graphic [design,][logo,][emblem,][characters,] as indicated.

2.4 RESILIENT-TILE ENTRANCE MATS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[Amarco Products]**
 2. **[Cactus Mat Mfg. Co.]**
 3. **[Consolidated Plastics Company, Inc]**
 4. **[Durable Corporation]**
 5. **[Entrance Inc]**
 6. **[Matco International]**
 7. **[Mats Inc.]**
 8. **[Matter Surfaces]**
 9. **[Milliken & Company]**
 10. **[Pawling Corporation]**
 11. **[The R.C. Musson Rubber Co.]**
 12. **[Turtle Plastics]**
 13. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Amarco Products]**
 2. **[Cactus Mat Mfg. Co.]**
 3. **[Consolidated Plastics Company, Inc]**
 4. **[Durable Corporation]**
 5. **[Entrance Inc]**
 6. **[Matco International]**
 7. **[Mats Inc.]**
 8. **[Matter Surfaces]**
 9. **[Milliken & Company]**
 10. **[Pawling Corporation]**
 11. **[The R.C. Musson Rubber Co.]**
 12. **[Turtle Plastics]**
 13. **<Insert manufacturer's name>**
- C. Rubber-Tire Tiles: Units of edge-grain-laminated and chenille-buffed, rubber-tire wall cuts; bonded to sheet rubber or other durable flexible backing sheet to form **3/8- to 7/16-inch- (9.5- to 11-mm-)** thick, square tile.
1. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].**
 2. Tile Size: **[12 inches (300 mm)][As indicated]<Insert size>.**
- D. **[Rubber][or][Vinyl]** Tiles: **[5/8-inch- (16-mm-)][7/16-inch- (11-mm-)]** thick, **[solid][open-grid][rubber][or][vinyl]** compound molded tiles with **[concealed interlocking joint tabs][1/4-inch- (6.4-mm-) deep, serpentine-grooved top face and knob-base back face on solid tile].**
1. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].**
 2. Tile Size: **[As indicated]<Insert size>.**
- E. Carpet-Type Tiles: **[Nylon][Polypropylene][Olefin][Polyester]** carpet bonded to **1/8- to 1/4-inch- (3.2- to 6.4-mm-)** thick, flexible vinyl backing to form mats **3/8 or 7/16 inch (9.5 or 11 mm)** thick with

nonraveling edges.

1. Colors, Textures, and Patterns: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].**
2. Tile Size: **[As indicated]<Insert size>.**

2.5 FRAMES

A. Recessed Frames: Manufacturer's standard extrusion.

1. Extruded Aluminum: **ASTM B221 (ASTM B221M)**, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
 - a. Color: **[Mill finish][Clear][Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities].**
2. Architectural Bronze: ASTM B455, Alloy UNS No. C38500.

B. Surface-Mounted Frames:

1. Tapered Frames: Tapered **[flexible vinyl edge-][aluminum]**frame members, not less than **[2 inches (50 mm)][1-1/2 inches (38 mm)]** wide**[, attached to mat at all four edges,]** with welded mitered corners.
 - a. Vinyl Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors].**
 - b. Aluminum Color: **[Mill finish][Clear][Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities].**

2.6 CONCRETE FILL AND GROUT MATERIALS

- ### A.
- Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.7 FABRICATION

- ### A.
- Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- ### B.
- Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- ### C.
- Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.

- D. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.8 ALUMINUM FINISHES

- A. Mill finish.
- B. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**][**AA-M12C22A31, Class II, 0.010 mm**] or thicker.
- C. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**][**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.

2.9 COPPER-ALLOY (BRONZE) FINISHES

- A. Finish designations prefixed by CDA comply with the system established by the Copper Development Association for designating copper-alloy finishes, as defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
- B. CDA Mechanical Finish Designation: [**M11, specular, as fabricated**][**M32, directionally textured, medium satin**].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, [**minimum recess depth**], and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
 - 1. For installation in terrazzo flooring areas, allow for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.
 - 2. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
 - 3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

4. Delay setting mats until construction traffic has ended.
- B. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.
 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13 00



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SECTION 12 48 13 13 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Recessed floor grilles and frames.

B. Related Requirements:

1. Section 124813 "Entrance Floor Mats and Frames" for flexible floor mats and frames.

1.2 COORDINATION

- A.** Coordinate size and location of recesses in concrete to receive floor grilles and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for entrance floor grilles and frames.

B. Shop Drawings:

1. Items penetrating floor grilles and frames, including door control devices.
2. Divisions between grille sections.
3. Perimeter floor moldings.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Grille: Assembled section of floor grille.
2. Frame Members: Sample of each type and color.

1.4 CLOSEOUT SUBMITTALS

- A.** Maintenance Data: For floor grilles and frames to include in maintenance manuals.

1.5 FIELD CONDITIONS

- A.** Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS**2.1 ENTRANCE FLOOR GRILLES, GENERAL**

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Babcock-Davis]**
2. **[Balco; a CSW Industrials Company]**
3. **[Construction Specialties, Inc.]**
4. **[JL Industries; Activar Construction Products Group, Inc.]**
5. **[K.N. Crowder Mfg. Inc]**
6. **[Kadee Industries, Inc]**
7. **[Mats Inc.]**
8. **[Matter Surfaces]**
9. **[McGill Architectural Products]**
10. **[Nystrom, Inc.]**
11. **[Pawling Corporation]**
12. **[ProSpec; H.B. Fuller Construction Products Inc.]**
13. **[Reese Enterprises, Inc]**
14. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Babcock-Davis]**
2. **[Balco; a CSW Industrials Company]**
3. **[Construction Specialties, Inc.]**
4. **[JL Industries; Activar Construction Products Group, Inc.]**
5. **[K.N. Crowder Mfg. Inc]**
6. **[Kadee Industries, Inc]**
7. **[Mats Inc.]**
8. **[Matter Surfaces]**
9. **[McGill Architectural Products]**
10. **[Nystrom, Inc.]**
11. **[Pawling Corporation]**
12. **[ProSpec; H.B. Fuller Construction Products Inc.]**
13. **[Reese Enterprises, Inc]**
14. **<Insert manufacturer's name>**

- C. Structural Performance: Provide floor grilles and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Uniform floor load of **[300 lbf/sq. ft. (14.36 kN/sq. m)]<Insert value>**.
2. Wheel load of **[350 lb (159 kg)]<Insert value>** per wheel.

- D. Accessibility Standard: Comply with applicable provisions in **[the DOJ's "2010 ADA Standards for Accessible Design"]&[ICC A117.1]<Insert regulation>**.

2.2 FLOOR GRILLES

- A. General: Provide manufacturer's standard floor-grille assemblies consisting of treads of type and profile

indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

- B. **[Aluminum][Bronze]** Floor Grilles: Provide manufacturer's standard floor grilles with extruded members, top-surfaced tread rails, and as follows:
1. Tread Rails: Extruded-**[aluminum][bronze]** tread rails.
 - a. Aluminum Color: **[Mill finish][Clear][Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]**.
 2. Tread Rail Spacing: **[1-1/2 inches (38 mm) o.c. with 1/8- to 3/16-inch- (3.2- to 4.8-mm-)][2 inches (50 mm) o.c. with 1/4-inch- (6.4-mm-)]<Insert dimensions>** wide openings between treads.
 3. Top Surface: **[Serrated aluminum][Serrated bronze][Serrated vinyl cap with UV stabilizer and antifungal additive][Textured-surface, resilient vinyl insert][Aluminum-oxide or silicon-carbide grit in epoxy matrix][Abrasive particles bonded to or imbedded in vinyl insert][Fusion-bonded, level-cut-pile nylon carpet insert; 1/4 inch (6.4 mm) high, 28 oz./sq. yd. (950 g/sq. m)]**.
 - a. Top Surface Color: **[Match tread rail][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range of industry colors]**.
 4. Grille Size: **[As indicated]<Insert size>**.
- C. Stainless Steel Floor Grille: Type 304.
1. Surface Treads: **[0.071-by-0.177-inch (1.8-by-4.49-mm) wire with 0.125-inch- (3.17-mm-)][0.090-by-0.172-inch (2.2-by-4.37-mm) wire with 0.145-inch- (3.68-mm-)][0.093-by-0.156-inch (2.36-by-3.96-mm) wire with 0.125-inch- (3.17-mm-)]** wide openings between wires.
 2. Support Rods: Spaced **1 inch (25.4 mm)** o.c., welded to each wire.
 3. Mat Grating: **5/8 inch (15.8 mm)** deep.
 4. Pit Grating: **1-1/8 inches (28.5 mm)** deep.
 5. Stainless Steel Finish: **[Mill][ASTM A480/A480M No. 4]**.
 6. Grille Size: **[As indicated]<Insert size>**.
- D. Lockdown: **[Manufacturer's standard][Hidden][In view]**.

2.3 FRAMES

- A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.4 SUPPORT SYSTEM

- A. Level Bed Applications: Provide manufacturer's standard, vinyl cushion support system.
- B. Drainage Pit Applications: Provide manufacturer's special deep-pit frame and support extrusion system with intermediate support beams, sized and spaced as recommended by manufacturer for indicated spans and equipped with vinyl support cushions.

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2.5 DRAIN PANS

- A. Provide manufacturer's standard[, **0.060-inch- (1.52-mm-) thick**], [**metallic-coated steel**][**aluminum**][or][**stainless steel**] sheet drain pan with **NPS 2 (DN 50)** drain outlet for each floor-grille unit. Coat bottom of pan with protective coating recommended by manufacturer.

2.6 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with **A60 (ZF180)** zinc-iron-alloy (galvannealed) coating or with **G60 (Z180)** mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A924/A924M.
- B. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
- C. Stainless Steel Flat Bars: ASTM A666, Type 304.
- D. Stainless Steel Angles: ASTM A276 or ASTM A479/A479M, Type 304.
- E. Aluminum Sheet: **ASTM B209 (ASTM B209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15.
- F. Extruded Aluminum: **ASTM B221 (ASTM B221M)**, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52 as standard with manufacturer.
- G. Extruded Architectural Bronze: ASTM B455, Alloy UNS No. C38500.

2.7 FABRICATION

- A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat surface of aluminum in contact with cementitious materials with manufacturer's standard protective coating.

2.8 ALUMINUM FINISHES

- A. Mill finish.
- B. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**][**AA-M12C22A31, Class II, 0.010 mm**] or thicker.
- C. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**][**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.

2.9 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: ASTM A480/A480M No. 4.
- C. Mill finish.

2.10 COPPER-ALLOY (BRONZE) FINISHES

- A. Finish designations prefixed by CDA comply with the system established by the Copper Development Association for designating copper-alloy finishes, as defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
- B. CDA Mechanical Finish Designation: **[M11, specular, as fabricated][M32, directionally textured, medium satin]**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.
- B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before floor grille and frame and drain pan installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed floor grilles and frames[**and drain pans**] to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action.[**Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.**]

3.3 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille



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recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13 13



Task	Specification	Specification Description
12 48 13 13	12 48 13 00	Entrance Floor Mats and Frames
12 48 13 16	12 48 13 00	Entrance Floor Mats and Frames
12 48 13 16	12 48 13 13	Entrance Floor Grilles



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SECTION 12 55 00 00 - DETENTION FURNITURE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Detention bunks.
2. Detention mattresses.
3. Detention desks.
4. Detention tables.
5. Detention seating.

B. Related Requirements:

1. Section 102813.63 "Detention Toilet Accessories" for detention toilet and bath accessories.
2. Section 111916 "Detention Gun Lockers" for detention gun lockers.
3. Section 119814 "Detention Door Hardware" for security key cabinets.

1.2 COORDINATION

- A.** Detention Specialist: Coordinate with Section 013513.16 "Special Project Procedures for Detention Facilities" for requirements of this Section that are to be performed by a Detention Specialist or other entity.
- B.** Coordinate installation of anchorages for detention furniture. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.
- C.** Coordinate size and location of recesses in wall construction to receive detention furniture.

1.3 PREINSTALLATION MEETINGS

- A.** Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention furniture.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For sealants, indicating VOC content.

3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For detention furniture.

1. Include plans, elevations, sections, and attachment details.
2. Indicate locations, dimensions, and profiles of wall and floor reinforcements.
3. Indicate locations and installation details of built-in anchors.
4. Show elevations of detention furniture and indicate dimensions of furniture, preparations for receiving anchors, and locations of anchorage.
5. Show details of attachment of detention furniture to built-in anchors.

D. Samples for Initial Selection: For detention furniture with factory-applied color finishes.

E. Samples for Verification: For each type of detention furniture indicated.

1. Furniture: Full-size units. Approved Samples may become part of the completed Work.
2. Detention Mattresses: Not less than **6 inches (152 mm)** square by full depth, including core and cover fabric.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Examination reports, documenting inspections of substrates, areas, and conditions.
- C. Anchor inspection reports, documenting inspections of built-in and cast-in anchors.
- D. Field quality-control reports, documenting inspections of installed products.
 1. Field quality-control certification, signed by Contractor[**and Detention Specialist**].

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For detention mattresses to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
 2. Tools: Provide **[two]**<Insert number> sets of tools for installing and removing security fasteners.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

B. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup of typical detention cell with furniture as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Detention Mattresses: Deliver wrapped to provide protection during transit and Project-site storage. Protect from contact with moisture.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify openings for recessed detention furniture by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert value>** percent.

2.2 DETENTION BUNKS

- A. Freestanding Single Bunks:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Willo Products Company, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [American Jail Products L.L.C.]
 - b. [BarkerBuilt, Division of Bob Barker Company, Inc]
 - c. [Detention Device Systems (DDS); DDS Group]
 - d. [Maximum Security Products Corp]
 - e. [Norix Group, Inc.]
 - f. [PSI LLC]
 - g. [Willo Products Company, Inc.]
 - h. <Insert manufacturer's name>
3. Bunk Pan: Formed from [0.134-inch (3.42-mm)][0.105-inch (2.66-mm)] nominal-thickness steel sheet[, perforated with at least six holes].
- a. Size: Minimum **27 inches (689 mm)** wide by **76 inches (1930 mm)** long with bunk pan **14 inches (356 mm)** above floor.
 - b. Edges: Turn up edges of [back and sides and turn down edge of front][back, sides, and front], with minimum **2-inch (51-mm)** flanges.
4. Drawer: Minimum **21 inches (533 mm)** wide by **24 inches (610 mm)** deep by **5 inches (127 mm)** high, with [full-width integral pull formed from steel sheet][solid-steel bar pull]; formed from **0.134-inch (3.42-mm)** nominal-thickness steel sheet.
5. Legs and Frames: Formed from **2-by-2-by-3/16-inch (51-by-51-by-4.8-mm)** steel angle welded at connections to each other and to bunk pan; provide four legs for each bunk.
6. Mounting Plates: Formed from **1/4-inch- (6-mm-)** thick, steel plate punched with one hole for floor anchorage; provide one mounting plate for each leg.

B. Freestanding Double Bunks:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [American Jail Products L.L.C.]
 - b. [BarkerBuilt, Division of Bob Barker Company, Inc]
 - c. [Detention Device Systems (DDS); DDS Group]
 - d. [Maximum Security Products Corp]
 - e. [Norix Group, Inc.]
 - f. [PSI LLC]
 - g. [Sweeper Metal Fabricators Corp]
 - h. [Willo Products Company, Inc.]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [American Jail Products L.L.C.]
 - b. [BarkerBuilt, Division of Bob Barker Company, Inc]
 - c. [Detention Device Systems (DDS); DDS Group]
 - d. [Maximum Security Products Corp]
 - e. [Norix Group, Inc.]
 - f. [PSI LLC]
 - g. [Sweeper Metal Fabricators Corp]
 - h. [Willo Products Company, Inc.]
 - i. <Insert manufacturer's name>

3. Bunk Pan: Formed from **[0.134-inch (3.42-mm)][0.105-inch (2.66-mm)]** nominal-thickness steel sheet[, **each pan perforated with at least six holes**].
 - a. Size: Minimum **27 inches (689 mm)** wide by **76 inches (1930 mm)** long with lower bunk pan **14 inches (356 mm)** above floor and upper bunk pan at least **49 inches (1245 mm)** above floor.
 - b. Upper Bunk Edges: Turn up edges of back and sides and turn down edge of front, with minimum **2-inch (51-mm)** flanges.
 - c. Lower Bunk Edges: Turn up edges of **[back and sides and turn down edge of front][back, sides, and front]**, with minimum **2-inch (51-mm)** flanges.
4. Drawers: Two; minimum **21 inches (533 mm)** wide by **24 inches (610 mm)** deep by **5 inches (127 mm)** high, with **[full-width integral pull formed from steel sheet][solid-steel bar pull]**; formed from **0.134-inch (3.42-mm)** nominal-thickness steel sheet.
5. Legs and Frames: Formed from **2-by-2-by-3/16-inch (51-by-51-by-4.8-mm)** steel angle welded at connections to each other and to bunk pan; provide four legs for each bunk.
6. Mounting Plates: Formed from **1/4-inch- (6-mm-)** thick, steel plate punched with one hole for floor anchorage; provide one mounting plate for each leg.
7. Assembly: **[Factory assembled][Knocked down for field assembly]**.

C. Wall-Mounted Bunks:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Sweeper Metal Fabricators Corp]**
 - h. **[Willo Products Company, Inc.]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[Sweeper Metal Fabricators Corp]**
 - h. **[Willo Products Company, Inc.]**
 - i. **<Insert manufacturer's name>**
3. Bunk Pan: Formed from **[0.134-inch (3.42-mm)][0.105-inch (2.66-mm)]** nominal-thickness steel sheet[, **perforated with at least six holes**].
 - a. Size: Minimum **27 inches (689 mm)** wide by **76 inches (1930 mm)** long with bunk pan **2 inches (51 mm)** from wall.

b. Edges: Turn up edges of **[back and sides and turn down edge of front]****[back, sides, and front]**, with minimum **2-inch (51-mm)** flanges.

4. Drawer: Minimum **21 inches (533 mm)** wide by **24 inches (610 mm)** deep by **5 inches (127 mm)** high, with **[full-width integral pull formed from steel sheet]****[solid-steel bar pull]**; formed from **0.134-inch (3.42-mm)** nominal-thickness steel sheet.
5. Combination End Panel/Mounting Plate: Formed from **3/16-inch- (0.048-mm-)** thick steel sheet welded at connections to bunk pan, with **2-inch (51-mm)** flange for wall mounting; provide two end panel/mounting plates for each bunk.

D. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

E. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations]****[Match Architect's sample]****[As selected by Architect from manufacturer's full range]**<Insert color and gloss>.

2.3 DETENTION MATTRESSES

A. Detention Mattresses: Comply with 16 CFR 1633 and California Technical Bulletin 121 as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - b. **[Chestnut Ridge Foam, Inc]**
 - c. **[Derby Industries]**
 - d. **[Norix Group, Inc.]**
 - e. **[UNICOR, Federal Prison Industries, Inc. (FPI)]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - b. **[Chestnut Ridge Foam, Inc]**
 - c. **[Derby Industries]**

- d. [Norix Group, Inc.]
 - e. [UNICOR, Federal Prison Industries, Inc. (FPI)]
 - f. <Insert manufacturer's name>
- B. Core: [Fire-resistive solid foam][Fire-resistive densified polyester][Cotton, with 10 percent boric acid treatment, tufted to nylon netting to retain shape].
- C. Cover Fabric: Vinyl bonded to nylon scrim; with a minimum total weight of **10 oz./sq. yd. (339 g/sq. m)**. Fabricate cover using [all sealed-seam construction with radio-frequency welded inverted seams][four-corner box construction with seams facing inside of detention mattress except end closing seam located at foot of mattress; sew with nylon thread in a double-lock stitch][, with integral pillow].
- 1. Color: [Clear][Manufacturer's standard].
- D. Thickness: [4 inches (102 mm)][6 inches (152 mm)].

2.4 DETENTION DESKS

- A. Single-Seat, Floor-Mounted Desks:
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Jail Products L.L.C.]
 - b. [BarkerBuilt, Division of Bob Barker Company, Inc]
 - c. [Maximum Security Products Corp]
 - d. [PSI LLC]
 - e. [Sweeper Metal Fabricators Corp]
 - f. [UNICOR, Federal Prison Industries, Inc. (FPI)]
 - g. [Willo Products Company, Inc.]
 - h. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Jail Products L.L.C.]
 - b. [BarkerBuilt, Division of Bob Barker Company, Inc]
 - c. [Maximum Security Products Corp]
 - d. [PSI LLC]
 - e. [Sweeper Metal Fabricators Corp]
 - f. [UNICOR, Federal Prison Industries, Inc. (FPI)]
 - g. [Willo Products Company, Inc.]
 - h. <Insert manufacturer's name>
 - 3. Desk Top: Formed from [0.134-inch (3.42-mm) nominal-thickness steel][0.105-inch (2.66-mm) nominal-thickness steel][0.141-inch- (3.57-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel] sheet, with minimum 1-1/2-inch (38-mm) flanged edges.
 - a. Size: Minimum **36 inches (914 mm)** wide by **15-1/2 inches (381 mm)** deep.
 - 4. Pedestal: Provide two storage shelves with sides and shelves formed from **0.134-inch (3.42-mm)**

- nominal-thickness steel.
5. Legs: Formed from **1-1/2-inch-square by 3/16-inch- (38-mm-square by 4.8-mm-)** thick steel tubing welded to desk top and mounting plate for an overall desk height of not less than **30 inches (762 mm)**.
6. Seat: **12-inch (305-mm)** diameter, formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.075-inch (1.90-mm) nominal-thickness steel][0.141-inch- (3.57-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel]** sheet; reinforced with **0.134-inch (3.42-mm)** nominal-thickness steel sheet, with minimum **1-1/2-inch (38-mm)** flanged edges.
7. Swivel Seat Support: Formed from **1-by-2-by-0.075-inch (25-by-51-by-1.90-mm)** nominal-thickness steel tubing, **2-inch-OD-by-0.075-inch (51-mm-OD-by-1.90-mm)** nominal-thickness steel tubing, or **3/8-inch- (9.5-mm-)** thick, steel plate bar; with **1/2-inch (12.7-mm)** pivot pin welded to legs.
8. Towel Bar: Formed from **1/4-by-1-1/2-inch (6-by-38-mm)** **[steel][stainless steel]** plate, mounted on one side of desk.
9. Mounting Plates: Formed from **1/4-inch- (6-mm-)** thick, steel plate punched with one hole for floor anchorage; provide one mounting plate for each leg.

B. Wall-Mounted Desk and Seat:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[Norix Group, Inc.]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[Norix Group, Inc.]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Desk: Formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.141-inch- (3.57-mm-) thick, stainless steel]** sheet, with minimum **1-1/2-inch (38-mm)** flanged edges.
 - a. Size: Minimum **[12 inches (305 mm) wide by 18 inches (457 mm) deep][18 inches (457 mm) wide by 18 inches (457 mm) deep][24 inches (610 mm) wide by 18 inches (457 mm) deep][30 inches (762 mm) wide by 20 inches (508 mm) deep]**.
4. Seat: Minimum **12 inches (305 mm)** wide by **[16 inches (406 mm)][18 inches (457 mm)]** deep; formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.141-inch- (3.57-mm-) thick, stainless steel]** sheet, with minimum **1-1/2-inch (38-mm)** flanged edges.

C. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for

- exposed applications.
3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
 5. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.

D. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
3. Stainless Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: **[No. 3][No. 4]**.

2.5 DETENTION TABLES

A. Pedestal-Style Table:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[PSI LLC]**
 - f. **[Sweeper Metal Fabricators Corp]**
 - g. **[Willo Products Company, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**

- d. **[Maximum Security Products Corp]**
 - e. **[PSI LLC]**
 - f. **[Sweeper Metal Fabricators Corp]**
 - g. **[Willo Products Company, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Tabletop: Formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.105-inch (2.66-mm) nominal-thickness steel][0.109-inch- (2.78-mm-) thick, stainless steel][0.078-inch- (1.98-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel]** sheet; reinforced with steel shapes or steel plate, with minimum **1-1/2-inch (38-mm)** flanged edges.
- a. Size: Minimum **[30 inches (762 mm)][40 inches (1016 mm)]** wide by length required for capacity by **[30 inches (762 mm)][35 inches (889 mm)]** high.
 - b. Game Top: Engrave, or otherwise integrally incorporate, checkerboard into tabletop.
4. Seats: **12-inch (305-mm)** diameter, formed from **[0.105-inch (2.66-mm) nominal-thickness steel][0.075-inch (1.90-mm) nominal-thickness steel][0.078-inch- (1.98-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel]** sheet; reinforced with **0.134-inch (3.42-mm)** nominal-thickness steel plate, with minimum **1-1/2-inch (38-mm)** flanged edges.
5. Pedestal Supports: Formed from **[3-inch-square by 3/16-inch- (76-mm-square by 4.8-mm-)][4-inch-square by 0.134-inch- (102-mm-square by 3.42-mm-)]** thick, steel tubing welded to top and base plate. **[Provide two pedestals for tables with capacity of more than four persons.]**
6. Seat Framing: Formed from **[3-inch-square by 0.134-inch- (76-mm-square by 3.42-mm-)][3-by-2-by-3/16-inch- (76-by-51-by-4.8-mm-)]** thick, steel tubing welded to pedestal supports.
7. Base Plate: Minimum **16-inch- (406-mm-)** square, **1/4-inch- (6-mm-)** thick, steel plate punched with four holes for floor anchorage.
8. Capacity: **[Four persons][Six persons][Eight persons][As indicated on Drawings]**.

B. Bench-Style Table:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Sweeper Metal Fabricators Corp]**
 - g. **[Willo Products Company, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Sweeper Metal Fabricators Corp]**
 - g. **[Willo Products Company, Inc.]**

- h. **<Insert manufacturer's name>**
 3. Tabletop: Formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.105-inch (2.66-mm) nominal-thickness steel][0.109-inch- (2.78-mm-) thick, stainless steel]** sheet; reinforced with steel channel frame or steel plate, with minimum **1-1/2-inch (38-mm)** flanged edges.
 - a. Size: Minimum **24 inches (610 mm)** wide by length required for capacity by **[30 inches (762 mm)][35 inches (889 mm)]** high.
 4. Benches: **12 inches (305 mm)** deep by length of tabletop, formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.105-inch (2.66-mm) nominal-thickness steel][0.109-inch- (2.78-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel]** sheet, with minimum **1-1/2-inch (38-mm)** flanged edges.
 5. Vertical Supports: Formed from **8-inch (203-mm)** hot-rolled steel channels or **0.164-inch- (4.18-mm-) thick, formed-steel channels**; braced and welded, with steel base plates punched for floor anchorage. **[Provide three supports for tables with capacity of more than four persons.]**
 6. Bench Supports: Formed from **2-by-2-1/2-by-1/4-inch- (51-by-64-by-6-mm-) thick, steel angle or 2-inch-square by 1/4-inch- (51-mm-square by 6-mm-) thick, steel tubing**; welded to vertical supports.
 7. Floor Anchor: Formed from steel angle punched for floor anchorage.
 8. Capacity: **[Four persons][Six persons][Eight persons][As indicated on Drawings].**
- C. Materials:
1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
 3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
 5. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.
- D. Finishes:
1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 3. Stainless Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: **[No. 3][No 4]**.

2.6 DETENTION SEATING**A. Floor-Mounted Stool:**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[UNICOR, Federal Prison Industries, Inc. (FPI)]**
 - h. **[Willo Products Company, Inc.]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Detention Device Systems (DDS); DDS Group]**
 - d. **[Maximum Security Products Corp]**
 - e. **[Norix Group, Inc.]**
 - f. **[PSI LLC]**
 - g. **[UNICOR, Federal Prison Industries, Inc. (FPI)]**
 - h. **[Willo Products Company, Inc.]**
 - i. **<Insert manufacturer's name>**
3. Seats: Minimum **12-inch (305-mm)** diameter, formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.075-inch (1.90-mm) nominal-thickness steel][0.125-inch- (3.18-mm-) thick, stainless steel][0.062-inch- (1.59-mm-) thick, stainless steel]** sheet; reinforced with **0.134-inch- (3.42-mm-) thick steel sheet** cut to interior dimension of seat, with minimum **1-1/2-inch (38-mm)** flanged edges.
4. Seat Support: Formed from steel pipe or **2-inch-OD-by-0.075-inch- (51-mm-OD-by-1.90-mm-) thick, steel tubing** welded to seat reinforcement and base plate for an overall stool height of not less than **18 inches (457 mm)**.
5. Base Plate: Minimum **6-by-1/4-inch- (152-by-6-mm-) thick, [square][round][steel]** punched with four holes for floor anchorage.

B. Wall-Mounted Stool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**
 - d. **[Willo Products Company, Inc.]**

- e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[Maximum Security Products Corp]**
 - c. **[PSI LLC]**
 - d. **[Willo Products Company, Inc.]**
 - e. **<Insert manufacturer's name>**
 3. Seat: Minimum **12-inch (305-mm)** diameter, formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.075-inch (1.90-mm) nominal-thickness steel][0.125-inch- (3.18-mm-) thick, stainless steel][0.078-inch- (1.98-mm-) thick, stainless steel]** sheet; reinforced with **0.134-inch- (3.42-mm-) thick steel sheet cut to interior dimension of seat, with minimum 1-1/2-inch (38-mm) flanged edges.**
 4. Seat Support: Formed from **1-by-2-by-0.075-inch- (25-by-51-by-1.90-mm-) thick, steel tubing; 2-inch-OD-by-0.075-inch- (51-mm-OD-by-1.90-mm-) thick, steel tubing; or 3/8-inch- (9.5-mm-) thick, steel plate bar; welded to seat reinforcement and wall bracket.**
 5. Swivel Wall Bracket: Minimum **1/2-inch (12.7-mm)** pivot pin, with **3/8-inch- (9.5-mm-) thick, steel plate [for welding to embedded steel plate][for welding to steel wall][punched with four holes for wall anchorage].**
- C. Floor-Mounted Bench:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Willo Products Company, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Jail Products L.L.C.]**
 - b. **[BarkerBuilt, Division of Bob Barker Company, Inc]**
 - c. **[Maximum Security Products Corp]**
 - d. **[Norix Group, Inc.]**
 - e. **[PSI LLC]**
 - f. **[Willo Products Company, Inc.]**
 - g. **<Insert manufacturer's name>**
 3. Bench Top: Formed from **[0.134-inch (3.42-mm) nominal-thickness steel][0.105-inch (2.66-mm) nominal-thickness steel][0.141-inch- (3.57-mm-) thick, stainless steel][0.109-inch- (2.78-mm-) thick, stainless steel]** sheet, with minimum **1-1/2-inch (38-mm) flanged edges.**
 - a. Size: Minimum **12 inches (305 mm)** deep by **[48 inches (1219 mm)][60 inches (1524**

mm)][72 inches (1829 mm)][96 inches (2438 mm)] long.

4. Supports: Formed from **0.164-inch- (4.18-mm-)** thick, formed-steel channels or **2-1/2-inch-OD-by-0.0677-inch- (64-mm-OD-by-1.7-mm-)** thick, steel tubing; welded to bench and base plate for an overall bench height of not less than **18 inches (457 mm)**. **[Provide three supports for benches with length of more than 72 inches (1829 mm).]**
5. Handcuff Ring: Formed from **3/8-inch- (9.5-mm-)** diameter, stainless steel rod; welded to **[front][back][both sides]** of each support.
6. Base Plates: Minimum **8-inch-square by 1/4-inch- (203-mm-square by 6-mm-)** thick, steel plate punched with four holes for floor anchorage.
7. Capacity: **[Four persons][Six persons][Eight persons][As indicated on Drawings]**.

D. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
5. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.
6. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless another weight is indicated or required by structural loads.

E. Finishes:

1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils (0.05 mm)**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
3. Stainless Steel Finish:
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3) Directional Satin Finish: **[No. 3][No 4]**.

2.7 FABRICATION

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Coordinate dimensions and attachment methods of detention furniture with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Form and grind edges and corners to be free of sharp edges or rough areas.
 - 1. Fabricate detention furniture with no more than **1/32-inch (0.8-mm)** gap between component materials. Weld edges that cannot be crimped to meet tolerance so as to provide a seamless joint with no place for concealment of contraband.
- E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- F. Weld corners and seams continuously to comply with referenced AWS standard and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention furniture rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- H. Cut, reinforce, drill, and tap detention furniture as indicated to receive hardware, security fasteners, and similar items.
- I. Form exposed work true to line and level with accurate angles, surfaces, and straight sharp edges.
- J. Form exposed connections with hairline joints, flush and smooth using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners. Locate joints where least conspicuous.
- K. Attach **[drawer slides][shelves]** to furniture **[by welding][with security fasteners]**.

2.8 SECURITY FASTENERS

- A. Security Fasteners: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]**
 - b. **[Bryce Fastener Mfg., Inc.]**

- c. [Safety Socket LLC]
 - d. [Tamper-Pruf Screws]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Acument Global Technologies, Inc.; Acument Intellectual Properties, LLC]
 - b. [Bryce Fastener Mfg., Inc.]
 - c. [Safety Socket LLC]
 - d. [Tamper-Pruf Screws]
 - e. <Insert manufacturer's name>
3. Drive-System Type: [Pinned Torx-Plus][Pinned Torx]<Insert system>.
4. Fastener Strength: 120,000 psi (827 MPa).
5. Socket Button Head Fasteners:
- a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
6. Socket Flat Countersunk Head Fasteners:
- a. Heat-treated alloy steel, ASTM F835.
 - b. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.
7. Socket Head Cap Fasteners:
- a. Heat-treated alloy steel, ASTM A574.
 - b. Stainless steel, ASTM F837 (ASTM F837M), Group 1 CW.
8. Protective Coatings for Heat-Treated Alloy Steel:
- a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.9 SECURITY SEALANTS

- A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Master Builders Solutions]
 - b. [Pecora Corporation]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Master Builders Solutions]**
 - b. **[Pecora Corporation]**
 - c. **<Insert manufacturer's name>**
 3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- B. Epoxy Security Sealants: Manufacturer's standard, non-sag, tamper-resistant sealant for joints with no movement.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]**
 - b. **[Master Builders Solutions]**
 - c. **[Pecora Corporation]**
 - d. **<Insert manufacturer's name>**
 3. Sealant shall have a VOC content of 250 g/L or less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall

not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
8. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.10 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to **[four]<Insert safety factor>** times the load imposed, as determined by testing per ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below:
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hot-dip galvanized per ASTM A153/A153M or ASTM F2329/F2329M.
- C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- D. Proprietary Built-in Masonry Anchors: Fabricated from **[0.134-inch (3.42-mm) nominal-thickness steel sheet][1/4-inch (6-mm) nominal-thickness steel plate][1/2-inch (12.7-mm) nominal-thickness steel plate]** into **[6-inch- (152-mm-)][8-inch- (203-mm-)]** deep blocks matching size of concrete masonry units; **with weld nuts attached on inside to receive field-bolted attachments**.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[M/BED Block Systems, LLC.]**
 - b. **[Peterson Detention Inc. (PDI)]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[M/BED Block Systems, LLC.]**
 - b. **[Peterson Detention Inc. (PDI)]**
 - c. **<Insert manufacturer's name>**
 3. Finish: **[Factory primed for field painting for anchors with field-welded attachments][Polyester powder coat for anchors with bolted attachments][Epoxy paint for anchors with bolted attachments]**.
- E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention furniture.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention furniture before detention furniture installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention furniture.
- D. Inspect built-in and cast-in anchor installations, before installing detention furniture, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Verify locations of detention furniture with those indicated on Shop Drawings.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention furniture to in-place construction. Include threaded fasteners for **[concrete][and][masonry]** inserts, security fasteners, and other connectors.
- B. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention furniture. Set detention furniture accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into **[concrete][or][masonry]** or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 5. Fillet Welds:
 - a. Minimum size of **1/8 inch by 1-1/2 inches (3 mm by 38 mm)** long, spaced not greater

than **12 inches (305 mm)** o.c. Fill spaces between welds with **[polyurethane][epoxy]** security sealant where weld is exposed.

b. Continuous.

- F. Assemble detention furniture requiring field assembly with security fasteners with no exposed fasteners on exposed faces and frames.
- G. Anchor furniture **[with security fasteners][by welding][as indicated on Drawings]** to floors and walls at intervals required by expected loads, but not more than **12 inches (305 mm)** o.c.
 - 1. Install anchors through backup reinforcing plates where necessary to avoid metal distortion.
 - 2. Use security fasteners with head styles appropriate for installation requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. **[Provide stainless steel security fasteners in painted materials.]**
 - 3. Weld nuts onto cast-in-place anchors after installation so as to be nonremovable.
- H. Apply **[polyurethane][epoxy]** security sealant at all exposed gaps between detention furniture and adjacent construction greater than **1/16 inch (1.6 mm)**.
- I. Install one detention mattress for each detention bunk.

3.3 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace detention work if inspections indicate that work does not comply with specified requirements. Remove malfunctioning units; replace with new units.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification **[endorsed by Detention Specialist]** that states installed products and their installation comply with requirements in the Contract Documents.

3.4 CLEANING AND PROTECTION

- A. Touchup Painting:
 - 1. Immediately after erection, clean bolted connections and abraded areas of shop paint, and paint exposed areas with same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 2. Cleaning and touchup painting of bolted connections and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION 12 55 00 00



Task	Specification	Specification Description
12 55 13 00	12 55 00 00	Detention Furniture
12 55 16 00	12 55 00 00	Detention Furniture
12 55 19 00	12 55 00 00	Detention Furniture
12 55 23 00	12 55 00 00	Detention Furniture
12 55 26 00	10 28 13 63	Detention Toilet Accessories
12 55 26 00	12 55 00 00	Detention Furniture
12 55 86 00	12 55 00 00	Detention Furniture
12 56 53 00	12 35 00 00	Plastic-Laminate-Clad Laboratory Casework
12 56 53 00	12 35 00 00a	Wood Laboratory Casework
12 59 16 00	01 11 19 00	No Specification Required



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SECTION 12 61 00 00 - FIXED AUDIENCE SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed audience seating.
2. Lecture-hall tables.

B. Related Requirements:

1. Section 126313 "Stadium and Arena Bench Seating" for continuous bench- or plank-type seating.

1.2 DEFINITIONS

- A. Pan:** An exposed, supporting seat bottom made of steel.
- B. Shell:** An exposed, supporting seat bottom or back made of materials other than steel.
- C. Tablet Arm:** A flat surface attached to a chair that has the primary function to support tasks such as writing and short-term reference-material handling.

1.3 ALLOWANCES

- A.** Fixed audience seating is part of fixed audience seating allowance.
- B.** Fabric for fixed audience seating is part of **<Insert allowance designation>** allowance.

1.4 PREINSTALLATION MEETINGS

- A.** Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Fixed audience seating.
2. Lecture-hall tables.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of components, and finishes for fixed audience seating.
2. Include electrical characteristics of electrical components, devices, and accessories.

C. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
4. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

D. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Seating Layout: Show seating layout, aisle widths, aisle-end alignment or stepping, row-lettering and chair-numbering scheme, chair widths, and chair spacing in each row.
3. Lecture-Hall Tables: Show table layout.
4. Accessories: Show locations and features of accessories, including **[left- and right-hand tablet arms][electrical devices][bookracks]<Insert item>**, and accessibility provisions.
5. Include diagrams for power, signal, and control wiring.

E. Samples for Initial Selection: For each type of exposed color, finish, texture, and pattern indicated.

1. Include Samples of accessories involving color and finish selection.

F. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Chair Unit: Full-size unit of each type[**and combination of finishes**].
2. Molded Plastic: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
3. Plastic Laminate: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
4. Baked-on Coating Finishes: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
5. Aluminum Finishes: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
6. Wood and Plywood Materials and Finishes: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
7. Upholstery Fabric: Full width by **[36-inch- (914-mm-)]<Insert dimension>** long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
8. Row-Letter and Chair-Number Plates: Full-size units with letters and numbers marked.
9. Aisle Lighting: Full-size unit.
10. Power and Data Service Devices: Full-size units.
11. Bookracks: Full-size unit.
12. Exposed Fasteners: Full-size units of each type.
13. Full-size samples[**of chair units**]<Insert item(s)>, if approved, will be returned to Contractor for use in Project.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Coordinate location of electrical wiring and devices eating layout to ensure that floor junction boxes for electrical devices are accurately located to allow connection without exposed conduit.
2. Coordinate location of diffuser pedestals with HVAC work and with properties of diffuser

pedestals to ensure alignment, proper air diffusion, and correct seat locations.

- B. Product Certificates: For each type of fixed audience seating.
- C. Material Certificates: For each type of flame-retardant treatment of upholstery fabric.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fixed audience seating to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Maintenance of self-rising seat mechanisms, folding armrests, and other operating components.
 - b. Adjustment of self-rising seat mechanisms to align seats.
 - c. Maintenance of electrical components, devices, and accessories.
 - d. Methods for maintaining upholstery fabric.
 - e. Precautions for cleaning materials and methods that could be detrimental to seating finishes and performance.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Chair Seats and Backs: [5]<Insert number> percent of quantity installed for each type and size of chair seat and back.
 - 2. Upholstered, Slip-on Cushions: [5]<Insert number> percent of quantity installed for each type and size of cushion.
 - 3. Fabric: [5]<Insert number> percent on the bolt of quantity installed for each type.
 - 4. Tablet Arms: [5]<Insert number> percent of quantity installed for each type and size of tablet arm; left- and right-hand mounted.
 - 5. Armrests: [5]<Insert number> percent of quantity installed for each type of armrest.
 - 6. Power Receptacles: [5]<Insert number> percent of quantity installed.
 - 7. Data Ports: [5]<Insert number> percent of quantity installed.
 - 8. Chair Seat Hinges: [5]<Insert number> percent of quantity installed.
 - 9. Aisle-Lighting Fixture Bulbs: [5]<Insert number> percent of quantity installed.
 - 10. Donor Plates: [100]<Insert number>.
 - 11. Bookracks: [5]<Insert number> percent of quantity installed.

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups of [area of fixed audience seating indicated on Drawings][two typical seats

or a typical two-seat unit][two typical seats in width and two typical rows deep with lecture-hall table between the rows]<Insert requirement>, including finishes and accessories:

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of fixed audience seating that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including standards, beams, and pedestals.
 - b. Faulty operation of self-rising seat mechanism.
 - c. Faulty operation of electrical components.
 - d. Wear and deterioration of fabric and stitching beyond normal use.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - f. <Insert failure modes>.
2. Warranty Periods: As follows, from date of Substantial Completion.
 - a. Structural: **[Five years][10 years][Lifetime]**.
 - b. Operating Mechanisms: **[Three years][Five years][Lifetime]**.
 - c. Electrical Components: **[Three][Five]** years.
 - d. Plastic, Wood, and Paint Components: **[Two][Three][Five]** years.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of seating required, including accessories and mounting components, from single source from single manufacturer.
1. Upholstery Fabric: Obtain fabric of a single dye lot for each color and pattern of fabric required.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics of Upholstered Chairs:
1. Fabric and Padding:
 - a. Fabric: Class 1 in accordance with DOC CS 191 or 16 CFR 1610, tested in accordance with California Technical Bulletin 117-2000.
 - b. Padding: Comply with California Technical Bulletin 117-2000.
 2. Upholstery Assembly: Assembly to comply with component-testing requirements of California Technical Bulletin 117-2013.

3. Full-Scale Fire Test: Comply with California Technical Bulletin 133.

B. Strength and Durability Performance: Chairs and components to pass testing in accordance with BIFMA X5.4.

2.3 FIXED AUDIENCE SEATING

A. Fixed Audience Seating : **[Assembly-space seating in permanent arrangement]**<Insert description> as indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[American Seating Company]**
- b. **[Ducharme Seating]**
- c. **[Hussey Seating Company]**
- d. **[Interkal LLC]**
- e. **[Irwin Seating Company]**
- f. **[KI]**
- g. **[Preferred Seating Company]**
- h. **[Seating Concepts LLC]**
- i. **[SERIES Seating LLC]**
- j. **[Sitmatic]**
- k. **[Southern Bleacher Company Inc.]**
- l. **[TSI Group]**
- m. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[American Seating Company]**
- b. **[Ducharme Seating]**
- c. **[Hussey Seating Company]**
- d. **[Interkal LLC]**
- e. **[Irwin Seating Company]**
- f. **[KI]**
- g. **[Preferred Seating Company]**
- h. **[Seating Concepts LLC]**
- i. **[SERIES Seating LLC]**
- j. **[Sitmatic]**
- k. **[Southern Bleacher Company Inc.]**
- l. **[TSI Group]**
- m. **<Insert manufacturer's name>**

B. Chair Mounting Standards: **[Floor][Riser]** attached of the following material:

- 1. Steel: One-piece, heavy-tube or reinforced sheet with welded mounting plate and welded connections for seat pivots, backs, armrests, and end panels.
- 2. Cast Metal: One-piece **[iron][aluminum]** castings with integral mounting points and attachment anchoring points for seat pivots, backs, and armrests.
- 3. Molded Plastic: One-piece, solid injection-molded plastic with integral reinforcing ribs for attachment and anchoring points for seat pivots, backs, and armrests.

- C. Chair Mounting Beam: Steel horizontal beam mounted on [floor][riser]-attached steel support pedestals spaced at intervals of 2 to 2-1/2 chair widths. [Chair attachments equipped with 180-degree rotation capability, returning to forward position when unoccupied.]
- D. Chair Mounting Pedestal: Floor-attached pedestal, manufacturer's standard [base with 90-degree left and right rotation capability][base with 360-degree rotation capability][diffuser pedestal at location(s) indicated]<Insert description>.
- E. End Panels: [Steel][Cast iron with design][Cast aluminum with design][Plastic laminate][Hardwood-veneer plywood][Solid hardwood][Fabric upholstered][Molded plastic].
1. Cast-Metal Design: [As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert design>.
 2. Decorative Insert: [Plastic laminate][Hardwood-veneer plywood][Solid hardwood][Fabric upholstered][Molded plastic][Customized medallion].
 3. Style: [Rectangular][Oval][Teardrop][Tapered][Panel to floor (pew)]<Insert requirement> with [square][rounded] corners.
- F. Fabric Upholstered Chairs:
1. Back:
 - a. Padding Thickness: [1-1/4 inches (32 mm)][2 inches (51 mm)][3 inches (76 mm)]<Insert dimension>.
 - b. Outer Back Surface: [Steel][Molded plastic][Fabric upholstered with 1/4-inch (6-mm) padding][Plastic laminate][Hardwood-veneer plywood]<Insert requirement>, with [concealed][exposed] fasteners.
 - c. Top Corners: [Square][Rounded].
 - d. Upholstery Options: [Tufting][decorative stitching][and][welt cord trim]<Insert option>.
 2. Seat: [Two part, top and bottom construction][One part, fully upholstered construction][One part, fully upholstered construction with removable upholstery cover] and as follows:
 - a. Top Padding Thickness: Minimum [1-1/2 inches (38 mm)][3 inches (76 mm)][4 inches (102 mm)]<Insert dimension> at front and rear edges.
 - b. Seat Bottom: [Steel sheet seat pan][Perforated-steel sheet seat pan with acoustical insulation][Hardwood-veneer-faced, formed plywood shell][Molded-plastic shell][Fabric upholstered]<Insert requirements>.
- G. Plastic Chairs: [Single][Double]-wall molded plastic and as follows:
1. Back: [Smooth surface][Textured surface][Formed slats][Smooth surface with upholstered inserts][Textured surface with upholstered inserts] with [square][rounded] top corners <Insert description>.
 2. Seat: [Smooth surface][Textured surface][With simulated slats][Smooth surface with upholstered inserts][Textured surface with upholstered inserts]<Insert description>.
 3. Upholstered Inserts: Padding and fabric covering over 1/8-inch (3-mm) plywood or MDF backing board, recessed [3/16 inch (5 mm)]<Insert dimension> into plastic surface, centered, and attached with hidden, vandal-resistant fasteners.
- H. Formed Hardwood-Veneer Chairs: Hardwood-veneer-faced, formed plywood backs and seats, with [concealed][exposed] fasteners.
1. Back Top Corners: [Square][Rounded]<Insert requirement>.

- I. Chair Width: **[Vary chair widths to optimize sightlines and row lengths][Single-width chair in each row]**, with **[minimum]** chair width of **[18 inches (457 mm)][19 inches (483 mm)][20 inches (508 mm)][21 inches (533 mm)][22 inches (559 mm)][23 inches (584 mm)][24 inches (610 mm)]**<Insert dimension> from center to center of armrests.
- J. Back Height: **[31 inches (787 mm)][32-1/2 inches (826 mm)][35 inches (889 mm)][38 inches (965 mm)][40 inches (1016 mm)][42 inches (1069 mm)][44 inches (1117 mm)]**<Insert dimension> high from the floor.
- K. Back Pitch: **[Fixed][Variable at set angles (planetarium)][Variable, hinged (rocker)]**.
 1. Back Angle: **[Angle for optimum viewing comfort][Different angles within manufacturer's available range, for optimum viewing comfort at each location][16 degrees][18 degrees][20 degrees][21 degrees][24 degrees]**<Insert requirement>.
 2. Chair Back Hinges: Self-lubricating type with noiseless mechanism that raises back to vertical position when chair is unoccupied.
- L. Chair Seat Hinges: Self-lubricating, with noiseless **[self-rising seat mechanism passing ASTM F851][manual operation]**, positive internal stops cushioned with rubber or neoprene, and requiring no maintenance.
 1. Self-Rising Seat Mechanism: **[Spring actuated, three-quarter fold][Spring actuated, full fold][Gravity actuated, full fold]**.
 2. Reclining Mechanism: Manufacturer's standard mechanism for reclining planetarium chairs.
- M. Armrests: **[Molded plastic][Solid hardwood][Upholstered][Plastic laminate on MDF][Integral scrolled cast iron]** with rounded edges[, **integral cup holder,**] and concealed mounting.
 1. Folding Armrests: Equip seating with **[folding aisle armrests where indicated][and][folding center armrests]**.
- N. Aisle-Lighting Fixtures: Manufacturer's standard **[round][rectangular-louvered][concealed-in-armrest]**<Insert description> fixtures.
 1. Bulb: **[LED][or][incandescent]**<Insert bulb type>.
 2. Power: **[12][24][or][120]**<Insert value> V.
 3. For low-voltage lighting, provide manufacturer's voltage-reduction device housed in safety enclosure equipped with fuses, terminal blocks, and safety disconnect.
- O. Power and Data Service Package: **[Manufacturer's standard service][Service]** to each seat position **[indicated]**, including terminal devices and wiring with **18 inches (457 mm)** of extra length and as follows:
 1. Power Receptacles: 120 V with wiring and **[duplex]** receptacle.
 2. Data Ports: Data-port terminal with wiring and receptacle jack **[of type indicated]**<Insert type>.
 3. Location: **[Manufacturer's standard location][On raceway beneath the seating][In the armrest][Beneath the armrest on front or side of the standard][In back panel of seat in front]**<Insert requirement>.
- P. Tablet Arms: **[Manufacturer's standard-size][Manufacturer's oversize]**<Insert size in minimum sq. in. (sq. mm) of surface area>, **[fixed][foldaway]** tablet arm with plastic-laminate writing surface over MDF or plywood core and with rounded, matching PVC edges.
 1. Mounting: **[Right-hand mounted unless otherwise indicated]**<Insert mounting>.
 2. Fold-Away Mechanism: Cast-iron or steel hinge and swivel mechanism that give positive support in open position and semiautomatic return to stored position below arm block and parallel to

chair.

Q. Accessible Seating:

1. Provide **[removable][rollaway][swing-away]** chair for each wheelchair space unless otherwise indicated.
2. Provide chairs with folding armrest on aisle side in locations indicated, but not less than 5 percent of aisle seats, dispersed through the audience seating area. Identify these seats with a sign or marker.

R. Row-Letter and Chair-Number Plates: **[Manufacturer's standard]<Insert description>**.

1. Material: **[Aluminum][Bronze][Stainless steel]<Insert material>** with black embossed characters.
2. Location: **[As indicated on Drawings][Row letter on top of aisle armrest][Chair number on front edge of seat][and][Chair number on top edge of back]<Insert requirement>**.
3. Attachment: **[Manufacturer's standard method][Adhesive][Minimum of two mechanical fasteners]<Insert attachment>**.

S. Accessibility-Logo Plates: **[Manufacturer's standard]<Insert description>**.

1. Material: **[Aluminum][Bronze][Stainless steel]<Insert material>** with black embossed characters.
2. Location: **[As indicated on Drawings][Top of armrest][Front of chair back]<Insert requirement>**.
3. Attachment: **[Manufacturer's standard method][Adhesive][Minimum of two mechanical fasteners]<Insert attachment>**.

T. Donor Plates: **[Manufacturer's standard]<Insert description>**.

1. Material: **[Aluminum][Bronze][Stainless steel]<Insert material>** with black embossed characters.
2. Location: **[As indicated on Drawings][Top of armrest][Front of chair back]<Insert requirement>**.
3. Attachment: **[Manufacturer's standard method][Adhesive][Minimum of two mechanical fasteners]<Insert attachment>**.

U. Bookracks: Manufacturer's standard **[under-chair][or][back-of-chair]** boxes, matching material and finish of mounting surface.

1. Size: Minimum **<Insert dimensions>**.

2.4 LECTURE-HALL TABLES

A. Lecture-Hall Tables : **[Continuous tables in permanent arrangement]<Insert description>** as indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Seating Company]**
 - b. **[Ducharme Seating]**

- c. [Hussey Seating Company]
 - d. [Irwin Seating Company]
 - e. [KI]
 - f. [Sitmatic]
 - g. [TSI Group]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Seating Company]
 - b. [Ducharme Seating]
 - c. [Hussey Seating Company]
 - d. [Irwin Seating Company]
 - e. [KI]
 - f. [Sitmatic]
 - g. [TSI Group]
 - h. <Insert manufacturer's name>
 - B. Supports: Attached to [floor][fixed audience seating] and matching construction and finish structure for fixed audience seating.
 - C. Table Top: Manufacturer's standard construction, [plastic laminate on MDF][hardwood-veneer plywood]<Insert requirement> with rounded edges[, integral pencil groove,] and concealed mounting.
 1. Depth: [Manufacturer's standard]<Insert dimension>.
 - D. Modesty Panels: Manufacturer's standard construction, [matching table top][plastic laminate on MDF][hardwood-veneer plywood][perforated steel][fabric upholstered]<Insert requirement>.
 1. Height: [Full height to 1 inch (25 mm) above floor][24 inches (610 mm)][14 inches (356 mm)]<Insert dimension>.
 - E. Power and Data Service Package: [Manufacturer's standard service][Service] to each seat position[indicated], including terminal devices and wiring with 18 inches (457 mm) of extra length and as follows:
 1. Power Receptacles: 120 V with wiring and[duplex] receptacle.
 2. Data Ports: Data-port terminal with wiring and receptacle jack [of type indicated]<Insert type>.
 3. Location: [Manufacturer's standard location][On raceway beneath the table top]<Insert requirement>.
- 2.5 MATERIALS AND FINISHES
- A. Composite Wood Products: Products shall be made without urea formaldehyde.
 - B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added

formaldehyde.

- D. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - 4. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
- E. Composite Wood Products: Products shall be made without urea formaldehyde.
- F. MDF (Medium-Density Fiberboard): ANSI A208.2, Grade MD.
- G. Concealed Plywood: HPVA HP-1 hardwood plywood or DOC PS 1 softwood plywood as standard with manufacturer.
- H. Exposed Plywood: HPVA HP-1, Face Grade A, hardwood-veneer core with color-matched hardwood-veneer faces.
- I. Hardwood Lumber and Veneer Faces: **[American black walnut][Red oak][Teak][Birch][Cherry][Maple]<Insert wood species>** selected to be free of visible defects.
 - 1. Stain and Finish: **[Manufacturer's standard, transparent, UV-resistant, protective finish][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert stain and finish>**.
- J. Plastic Laminate: ISO 4586-3, manufacturer's standard grade.
 - 1. Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
- K. Molded Plastic: High-density polyethylene or polypropylene, blow or injection molded, with surface that is mar and dent resistant.
 - 1. Provide with UV inhibitors to retard fading.
 - 2. Color and Texture: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and texture>**.
- L. Fabric: Manufacturer's standard **[100 percent nylon][100 percent polyolefin]<Insert fiber>** with flame-retardant treatment if required to meet performance requirements.
 - 1. Weight: **[12 oz./linear yd. (0.37 kg/linear m)][16 oz./linear yd. (0.50 kg/linear m)][18 oz./linear yd. (0.56 kg/linear m)][20 oz./linear yd. (0.62 kg/linear m)]<Insert weight>**.
 - 2. Color and Pattern: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and pattern>**.
- M. Upholstery Padding: Flexible, cellular, molded or slab polyurethane foam.
 - 1. Pounding-Fatigue Performance: Grade AP (heavy-duty use) for seats and Grade BP (normal duty use) for backs; in accordance with ASTM D3453.

- N. Metal Finish: Finish exposed metal parts with manufacturer's standard **[polyurethane][baked-on][minimum 1.5-mil- (0.04-mm-) thick, polyester baked-on powder][minimum 1.5-mil- (0.04-mm-) thick, epoxy baked-on powder][minimum 70 percent by weight, PVDF fluoropolymer resin baked-on powder]<Insert requirement>** coating.
 - 1. Color: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>**.
- O. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 FABRICATION

- A. Floor Attachments: Fabricate to conform to floor slope so that standards and pedestals are plumb and chairs are maintained at same angular relationship to vertical throughout Project.
- B. For beam-mounted chairs **[and tables]** in curved patterns, curve the beam uniformly to the various radii required for the rows.
- C. Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
- D. Upholstered Chairs: Fabricate as follows:
 - 1. Two-Part Upholstered Back: Padded cushion glued to a curved **[steel][plywood][or][molded-plastic]** inner panel and covered with easily replaceable fabric; with curved **[steel][or][molded-plastic]** outer back shell that fully encloses upholstery edges.
 - 2. Two-Part, Steel-Pan Seats: Upper part, an upholstered cushion with molded padding over no fewer than **[five]<Insert number>** serpentine springs attached to reinforced steel frame, with weight-distributing and abrasion-resistant sheeting separating padding from springs, and removable for reupholstering without removing steel pan from chair. Lower part, a steel pan, reinforced at stress points and completely enclosing hinges and self-rising mechanism.
 - 3. Two-Part, Molded-Plastic Seats: Upper part, an upholstered cushion with formed padding over a five-ply plywood panel **[with fabric cover conforming to shape of cushion to conceal inner seat structure and hinge mechanism]**. Lower part, a molded-plastic shell.
 - 4. One-Part Seats: Double-wall plastic shells **[fitted with a padded upholstered cushion and covered with easily replaceable fabric][padded and fully upholstered]**.
- E. Double-Wall, Molded-Plastic Chairs: Contoured seat and back fabricated of double-wall, blow-molded plastic; both sides of seat and back components are finished surfaces. Reinforce plastic with interior steel plates at attachment points.
- F. Single-Wall, Molded-Plastic Chairs: Contoured plastic shell with smoothly rolled edges and reinforcing ribs on underside of shell. Fabricate for attachment of chair to support with self-threading, corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine floors, risers, and other adjacent work and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

- B. Verify that electrical connections are properly located.
- C. Verify that HVAC air-distribution locations are correct.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install seating[**and tables**] in locations indicated and fasten to substrates in accordance with manufacturer's written installation instructions.
 - 1. Install seating with each chair capable of complying with performance requirements without failure or other conditions that might impair the chair's usefulness.
 - 2. Install standards and pedestals plumb.
 - 3. Install seating so moving components operate smoothly and quietly.
- B. Install seating[**and tables**] with end standards aligned or stepped as indicated from first to last row and with backs and seats varied in [width][and][spacing] to optimize sightlines.
- C. Install riser-mounted standards and attachments to maintain uniform chair heights above floor.
- D. Where seating is indicated in curved rows, install seating[**and tables**] at a constant radius unless otherwise indicated.
- E. Install wiring conductors and cables concealed in components of seating[**and tables**] and accessible for servicing.
 - 1. Connect electrical service at junction-box locations in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Connect data communication service at junction-box locations in accordance with [Section 271513 "Communications Copper Horizontal Cabling."][Section 271523 "Communications Optical Fiber Horizontal Cabling."]

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Inspect components, assemblies, and equipment, including connections, to verify proper, complete, and sturdy installation in accordance with manufacturer's written instructions and product specifications.
 - 2. Verify that self-rising seats return to uniform at-rest, raised position.
 - 3. Test power receptacles as specified in Section 262726 "Wiring Devices" when power is activated.
 - 4. Test data ports when data connection is activated.
- B. Fixed audience seating will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust chair backs so that they are at required angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly so they operate easily. Lubricate bearings and sliding parts as recommended in writing by manufacturer.
- C. Adjust self-rising seat mechanisms so seats in each row are aligned when in upright position.
- D. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.
- E. Replace damaged and malfunctioning components that cannot be acceptably repaired.
- F. Replace upholstery fabric damaged during installation or work of other trades.

END OF SECTION 12 61 00 00

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Task	Specification	Specification Description
12 61 13 00	12 61 00 00	Fixed Audience Seating
12 61 16 00	12 61 00 00	Fixed Audience Seating
12 61 19 00	12 61 00 00	Fixed Audience Seating
12 61 21 00	12 61 00 00	Fixed Audience Seating
12 62 23 00	01 11 19 00	No Specification Required



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SECTION 12 66 00 00 - TELESCOPING STANDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall-attached telescoping stands.
 - 2. Recessed telescoping stands.
 - 3. Freestanding telescoping stands.

1.2 DEFINITIONS

- A. Forward Folding: Wall- or floor-attached bleachers that open in the forward direction by moving the front row away from the stack to the fully extended position.
- B. Reverse Folding: Floor attached at the first row, that open in the backward direction - by moving the last row away from the stack to the fully extended position. The stacked unit becomes a divider wall.
- C. Freestanding: Being free or away from a permanent wall.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
 - 2. Include load capacities, assembly characteristics, and furnished accessories.
 - 3. Include electrical characteristics of electrical components, devices, and accessories.
- B. Shop Drawings: For telescoping stands in both stacked and extended positions.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include load capacities.
 - 3. Show seating layout, aisle widths, row-lettering and seat-numbering scheme, and wheelchair accessibility provisions.
 - 4. Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For each type of exposed product and for each color and texture required.
 - 1. Include Samples of accessories involving color and finish selection.

- D. Samples for Verification: For the following products prepared on Samples of size indicated below:
1. Decking: **6-inch- (150-mm-)** square Samples of finished material.
 2. Metal Components: **6-inch- (150-mm-)** square Sample of each color and finish indicated.
 3. Seating Material: **6-inch- (150-mm-)** square Sample of each seating material, color, and finish indicated.
 4. Seat Unit: Full-size unit of each type.
 5. Upholstery Fabric: **12-inch- (300-mm-)** square Sample of fabric from dye lot to be used for the Work, with specified treatments applied. [**Show complete pattern repeat. Mark top and face of fabric.**]
 6. Signage: Full-size units for [row letters][seat numbers][each type of accessibility sign][and][custom graphics].
- E. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 3. Laboratory Test Reports: For composite wood products, indicating compliance with the formaldehyde emissions evaluation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of telescoping stand assembly.
- C. Material Certificates: For each type of flame-retardant treatment of upholstery fabric.
- D. Field quality-control reports.
- E. Qualification Statements: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Procedures for conducting periodic inspections.
 - b. Precautions for cleaning materials and methods that could be detrimental to telescoping-stand finishes and performance.
 - c. Methods for maintaining upholstery fabric.

1.7 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice, including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: Provide proof of use of vendors that are certified for chain of custody by an FSC-

accredited certification body.

- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.8 MOCKUPS

- A. Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical telescoping stand as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of telescoping stand assembly that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including bench seating and attached components.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - c. <Insert failure modes>.
 - 2. Warranty Periods: [Five]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Telescoping stands to withstand the effects of gravity loads, operational loads, and other loads and stresses in accordance with ICC 300.
- B. Fire-Test-Response Characteristics of Upholstered Chairs: Comply with California Technical [Bulletin 117][and][Bulletin 133].
- C. Accessibility Standard: Comply with applicable provisions in [the DOJ's "2010 ADA Standards for Accessible Design"] [the ABA Standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.

2.2 WALL-ATTACHED TELESCOPING STANDS

- A. Wall-Attached Telescoping Stands : Forward-folding system, in which the bleachers open in the forward

direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to wall construction.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hussey Seating Company]**
 - b. **[Interkal LLC]**
 - c. **[Irwin Seating Company]**
 - d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hussey Seating Company]**
 - b. **[Interkal LLC]**
 - c. **[Irwin Seating Company]**
 - d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
3. Row Spacing: **[22 inches (560 mm)][26 inches (660 mm)][32 inches (813 mm)][As indicated on Drawings]<Insert dimension>**.
4. Row Rise: **[one dimension between 11 and 12 inches (279 and 305 mm)][16 inches (406 mm)][As indicated on Drawings]<Insert dimension>**.
5. Seat Type: **[Benches][Chairs]<Insert requirement>**.
6. Elevated Front Row: **[Height indicated on Drawings]<Insert dimension>**.
7. Operation: **[Manually operated][Electrically operated, with friction-type, integral power unit][Electrically operated, with non-friction-type, integral power unit]**.
8. Electrical Characteristics for Each Seating Section:
 - a. Horsepower: **[1/2][1-1/2][2]<Insert horsepower>**.
 - b. Single-Phase Voltage: **[115 V ac][208 V ac][230 V ac]**, 60 Hz.
 - c. Three-Phase Voltage: **[208 V ac][230 V ac][460 V ac]**, 60 Hz.
9. Electrical Controls:
 - a. Control Devices: **[Wall-attached][Walk-along pendant][Wireless]** control system.
 - b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
 - c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at **10 ft. (3 m)**, mounted under telescoping seating for audio and visual warning during operation.
 - d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.3 RECESSED TELESCOPING STANDS

- A. Recessed Telescoping Stands : Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to building construction so that closed stands are recessed in opening.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hussey Seating Company]**
 - b. **[Interkal LLC]**
 - c. **[Irwin Seating Company]**
 - d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hussey Seating Company]**
 - b. **[Interkal LLC]**
 - c. **[Irwin Seating Company]**
 - d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
3. Row Spacing: **[22 inches (560 mm)][26 inches (660 mm)][32 inches (813 mm)][As indicated on Drawings]<Insert dimension>**.
4. Row Rise: **[one dimension between 11 and 12 inches (279 and 305 mm)][16 inches (406 mm)][As indicated on Drawings]<Insert dimension>**.
5. Seat Type: **[Benches][Chairs]<Insert requirement>**.
6. Elevated Front Row: **[Height indicated on Drawings]<Insert dimension>**.
7. Operation: **[Manually operated][Electrically operated, with friction-type, integral power unit][Electrically operated, with non-friction-type, integral power unit]**.
8. Electrical Characteristics for Each Seating Section:
 - a. Horsepower: **[1/2][1-1/2][2]<Insert horsepower>**.
 - b. Single-Phase Voltage: **[115 V ac][208 V ac][230 V ac]**, 60 Hz.
 - c. Three-Phase Voltage: **[208 V ac][230 V ac][460 V ac]**, 60 Hz.
9. Electrical Controls:
 - a. Control Devices: **[Wall-attached][Walk-along pendant][Wireless]** control system.
 - b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
 - c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at **10 ft. (3 m)**, mounted under telescoping seating for audio and visual warning during integral power operation.
 - d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.4 FREESTANDING TELESCOPING STANDS

- A. Freestanding, Forward-Folding, Telescoping Stands : Floor-attached system, in which the bleachers open in the forward direction, by moving the front row away from the stack to the fully extended position, and the rear of bleacher understructure permanently attaches to floor construction.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Hussey Seating Company]
- b. [Interkal LLC]
- c. [Irwin Seating Company]
- d. [Royal Stewart Ltd.]
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Hussey Seating Company]
- b. [Interkal LLC]
- c. [Irwin Seating Company]
- d. [Royal Stewart Ltd.]
- e. <Insert manufacturer's name>

- 3. Row Spacing: [22 inches (560 mm)][26 inches (660 mm)][32 inches (813 mm)][As indicated on Drawings]<Insert dimension>.
- 4. Row Rise: [one dimension between 11 and 12 inches (279 and 305 mm)][16 inches (406 mm)][As indicated on Drawings]<Insert dimension>.
- 5. Seat Type: [Benches][Chairs]<Insert requirement>.
- 6. Elevated Front Row: [Height indicated on Drawings]<Insert dimension>.
- 7. Operation: [Manually operated][Electrically operated, with friction-type, integral power unit][Electrically operated, with non-friction-type, integral power unit].
- 8. Electrical Characteristics for Each Seating Section:

- a. Horsepower: [1/2][1-1/2][2]<Insert horsepower>.
- b. Single-Phase Voltage: [115 V ac][208 V ac][230 V ac], 60 Hz.
- c. Three-Phase Voltage: [208 V ac][230 V ac][460 V ac], 60 Hz.

9. Electrical Controls:

- a. Control Devices: [Wall-attached][Walk-along pendant][Wireless] control system.
- b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
- c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 ft. (3 m), mounted under telescoping seating for audio and visual warning during integral power operation.
- d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

- B. Freestanding, Reverse-Folding, Telescoping Stands : Floor-attached, reverse-opening system, in which the bleachers open in the backward direction, by moving the last row away from the stack to the fully extended position, and the front of bleacher understructure permanently attaches to floor construction.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Hussey Seating Company]
- b. [Interkal LLC]
- c. [Irwin Seating Company]

- d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hussey Seating Company]**
 - b. **[Interkal LLC]**
 - c. **[Irwin Seating Company]**
 - d. **[Royal Stewart Ltd.]**
 - e. **<Insert manufacturer's name>**
 3. Row Spacing: **[22 inches (560 mm)][26 inches (660 mm)][32 inches (813 mm)][As indicated on Drawings]<Insert dimension>**.
 4. Row Rise: **[one dimension between 11 and 12 inches (279 and 305 mm)][16 inches (406 mm)][As indicated on Drawings]<Insert dimension>**.
 5. Seat Type: **[Benches][Chairs]<Insert requirement>**.
 6. Elevated Front Row: **[Height indicated on Drawings]<Insert dimension>**.
 7. Aisle Recovery: Equip unit with ability to create a front cross-aisle **[36 inches (914 mm)][42 inches (1067 mm)]<Insert dimension>** wide when stand is open.
 8. Operation: **[Manually operated][Electrically operated, with friction-type, integral power unit][Electrically operated, with non-friction-type, integral power unit]**.
 9. Electrical Characteristics for Each Seating Section:
 - a. Horsepower: **[1/2][1-1/2][2]<Insert horsepower>**.
 - b. Single-Phase Voltage: **[115 V ac][208 V ac][230 V ac]**, 60 Hz.
 - c. Three-Phase Voltage: **[208 V ac][230 V ac][460 V ac]**, 60 Hz.
 10. Electrical Controls:
 - a. Control Devices: **[Wall-attached][Walk-along pendant][Wireless]** control system.
 - b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
 - c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at **10 ft. (3 m)**, mounted under telescoping seating for audio and visual warning during integral power operation.
 - d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.5 COMPONENTS

A. Benches: Seats and skirts.

1. Material: **[Lumber with transparent finish][Molded plastic with contour surfaces][Steel sheet with vinyl-clad finish]<Insert material>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][Manufacturer's standard][As selected by Architect from manufacturer's standard]<Insert color>**.
2. Bench Height: **[Not less than 16 inches (406 mm) or more than 18 inches (457 mm)]<Insert requirement>**.
3. Bench Depth: **[10 inches (254 mm)][12 inches (305 mm)]<Insert dimension>**.
4. Backs: Folding backrests permanently attached to bench units.

- a. Material: **[Lumber with transparent finish][Molded plastic with contour support surface in color matching seat]<Insert material>**.
 - b. Operation: **[Manual][Automatic]**.
- B. Chairs: Rotating from upright, locked position to folded-down position that allows supporting platform to telescope for storage.**[In upright position, seats fold up to allow passage of persons within row.]**
 1. Operation: **[Manual][Spring-assisted, manual fold-up. Automatic release from upright position except for first row, and automatic fold-down to stored position][Automatic]<Insert description>**.
 2. Chair Width: **[As indicated on Drawings]<Insert width>**.
 3. Seat Height: **[Not less than 17 inches (432 mm) or more than 18 inches (457 mm)]<Insert requirement>**.
 4. Seats: **[Molded plastic][Molded plastic with padded upholstery insert][Fully upholstered, self-rising, folding]<Insert description>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][Manufacturer's standard][As selected by Architect from manufacturer's full range]<Insert color>**.
 5. Backs: **[Molded plastic][Molded plastic with padded upholstery insert][Fully upholstered]<Insert description>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][Manufacturer's standard][As selected by Architect from manufacturer's full range]<Insert color>**.
 6. Armrests: **[Molded plastic][Molded plastic, self-rising and self-storing][with cup holder]<Insert description>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][Manufacturer's standard][As selected by Architect from manufacturer's full range]<Insert color>**.
- C. Wheelchair-Accessible Seating: Locate **[seating cutouts][retractable truncated benches][removable modular chairs][aisle seats without armrests, with folding armrests, or with removable armrests]<Insert requirements>** to provide wheelchair-accessible seating at locations indicated on Drawings.
 1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300.
 2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to **1-1/2 inches (38 mm)** from finished floor.
- D. Deck: **[Aluminum][Plywood, 5/8 inch (16 mm) thick][Plywood, 3/4 inch (19 mm) thick][Manufacturer's standard laminated panel]<Insert requirement>**.
 1. Finish: **[Mill][Clear anodized][Color anodized][Polyethylene textured overlay bonded to substrate with exterior glue][Transparent][Paint][Manufacturer's standard carpet bonded to substrate][Manufacturer's standard]<Insert requirements>**.
 - a. Color: **[As indicated by manufacturer's designations][Match Architect's sample][Manufacturer's standard][As selected by Architect from manufacturer's standard colors]<Insert color>**.

- E. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- F. Safety Rails: Steel, finished with manufacturer's standard powder coat system.
 - 1. **[Removable][Folding][Self-storing]** mid-aisle handrails located at centerline of each aisle with seating on both sides.
 - 2. End rails (guards) that are **[telescoping and self-storing][removable]**.
 - 3. Back rails (guards) along rear of units where required by ICC 300.
 - 4. **[Removable][Fixed]** front rails (guards) along front of units where required by ICC 300.
 - 5. **[Removable][Fixed]** rails around accessible seating cutouts and truncations.
 - 6. Removable, programming-support front rails to allow seating in upper rows while lower rows remain in the stored position.
 - 7. Color: **[Black][Match Architect's sample][Manufacturer's standard neutral color]<Insert color>**.
- G. Understructure: Structural steel.
 - 1. Finish: **[Manufacturer's standard][Water-based acrylic][Alkyd-enamel, two-coat system,][Epoxy-resin-based, textured, powder coat system,]<Insert finish>** rust-inhibiting finish.
 - 2. Color: **[Manufacturer's standard]<Insert color>**.
- H. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.
 - 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than **4 inches (100 mm)** in diameter and **1-1/2 inches (38 mm)** wide.
- I. Control Devices:
 - 1. Wall Attached: **[Manufacturer's standard][Keyed-switch]** control station, located within full view of each stand and its movement area. **[Provide two keys per station.]**
 - 2. Walk-Along Pendant: Manufacturer's standard unit, which plugs into first row of each operating section. Provide **[one unit][two units][three units][one unit for each operating section]<Insert requirement>**.
 - 3. Wireless: Hand-held, wireless transmission unit that operates wireless receivers in each operating section, with a transmission range to keep handheld control unit within close proximity and with full view of stand and its movement area. Provide **[one unit][two units][three units][one unit for each operating section]<Insert requirement>**.
- J. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.6 ACCESSORIES

- A. Steps:
 - 1. Slip-resistant, abrasive tread **[nosings][surfaces]** at aisles.
 - 2. Intermediate aisle steps, fully enclosed, at each aisle.
 - 3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
 - 4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.
- B. Portable Stairs: Portable access-stair units equipped with handrails, with no fewer than four full-swiveling, nonmarring wheels and a locking mechanism to prevent movement during use.

- C. Ramps: Portable access-ramp units, slope **[as indicated on Drawings]****[to comply with requirements of accessibility standard]**, equipped with handrails, with no fewer than four full-swiveling, nonmarring wheels and a locking mechanism to prevent movement during use.
- D. Closure Panels and Void Fillers:
 - 1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
 - 2. End panels covering exposed ends of stands in the stored position.
 - 3. Back panels covering rear of freestanding units. Panels extend full height and width of unit.
 - 4. Panels at cutouts and truncations for accessible seating.
 - 5. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
 - 6. Gap fillers for closing openings between stand units or between stand units and adjoining construction.
- E. Spanner Seats: Removable, designed to span area between adjacent stand units[, **in locations indicated on Drawings**]**<Insert requirements>**.
- F. Signage:
 - 1. Row letters at each row end.
 - 2. Seat numbers **[at 18 inches (457 mm) o.c. on benches]****[and]****[on each chair]**.
 - 3. Accessibility signs at each accessible space[**and accessible aisle seat**].
 - 4. Custom graphics as indicated on Drawings **[on benches]****[on end panels]****[on rear panels]****[on whole seating array]****<Insert requirements>**.
- G. Scorer's Table: Removable unit that attaches to mounting sockets installed in telescoping stand unit.

2.7 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Certified Wood: Verify product is certified as "FSC Pure"[**or "FSC Mixed Credit"**] in accordance with FSC STD-01-001 and FSC STD-40-004.
- C. Certified Wood: Verify product is labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- D. Certified Wood: Verify product is certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- E. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- F. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - 1. Hardwood Plywood: 0.05 ppm.
 - 2. Particleboard: 0.09 ppm.
 - 3. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.

4. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.

- G. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for **[B & B finish (B and better)][C & Btr finish (C and better)]** grade-of-finish requirements.
- H. Plywood: PS 1 as standard with manufacturer.
- I. Molded Plastic: High-density polyethylene; blow or injection molded, color-pigmented, textured, impact-resistant, with integral reinforcing ribs for attachment and anchoring points. Provide with UV inhibitors to retard fading.

2.8 FABRICATION

- A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.
- B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- C. Form exposed work with flat, flush surfaces, level and true in line.
- D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.
 - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install telescoping stands in accordance with ICC 300 and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. ICC 300 Inspection: Inspect installed telescoping stands to verify that construction, installation, and operation are in accordance with ICC 300 requirements.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and

12 - Furnishings

equipment.

3. Telescoping stands will be considered defective if they do not pass tests and inspections.

- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each telescoping stand unit to operate in accordance with manufacturer's written instructions.
- C. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up factory-applied finishes or replace components as required to restore damaged or soiled areas.
- D. Replace upholstery fabric damaged during installation or work of other trades.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION 12 66 00 00



Task	Specification	Specification Description
12 66 13 00	12 66 00 00	Telescoping Stands



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13 - Special Construction

Task	Specification	Specification Description
13 34 00 00	13 34 23 16	Fabricated Control Booths
13 34 16 00	13 34 23 16	Fabricated Control Booths



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SECTION 13 34 16 13 - STADIUM AND ARENA BENCH SEATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fixed, continuous bench- or plank-type metal seating.
- B. Related Requirements:
 - 1. Section 126100 "Fixed Audience Seating" for fixed chair-type seating.
 - 2. Section 126600 "Telescoping Stands" for multiple-tiered benches on interconnected folding platforms that close for storing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of components, and finishes for seating.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For bench seating.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Seating Layout: Show seating layout, aisle widths, aisle-end alignment or stepping, and row-lettering scheme.
- D. Samples for Initial Selection: For each type of exposed material, color, finish, and texture indicated.
 - 1. Include Samples of accessories involving color and finish selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 - 1. Aluminum Finishes: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
 - 2. Baked-on Coating Finishes: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
 - 3. Row-Letter Plates: Full-size units with characters marked.
 - 4. Seat-Number Plates: Full-size units with characters marked.
 - 5. Donor Plates: Full-size units.
 - 6. Exposed Fasteners: Full-size units of each type.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer][and][manufacturer]**.
- B. Product Certificates: For each type of bench seating.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For bench seating to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Individual Seat Pads: **[5]<Insert number>** percent of quantity installed for each color.
 - 2. Individual Backrest Pads: **[5]<Insert number>** percent of quantity installed for each color.
 - 3. Row-Letter Plates: **[100]<Insert number>**, **[blank][with characters marked]<Insert requirement>**.
 - 4. Seat-Number Plates: **[100]<Insert number>**, **[blank][with characters marked]<Insert requirement>**.
 - 5. Donor Plates: **[100]<Insert number>**, blank.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups of **[area of bench seating indicated on Drawings]<Insert requirement>**, including finishes and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of bench seating that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including bench seating and attached components.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

c. <Insert failure modes>.

2. Warranty Periods: **[Five]**<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of bench seating required, including accessories and mounting components, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Bench seating shall withstand the effects of gravity and other loads within limits and under conditions indicated.
1. Vertical Live Load: **[120 lb/ft. (179 kg/m)]****[As indicated on Drawings]**<Insert load>.
 2. Horizontal Sway Loads: **[24 lb/ft. (36 kg/m) parallel to bench and 10 lb/ft. (15 kg/m) perpendicular to bench]****[As indicated on Drawings]**<Insert loads>.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]**<Insert temperature change>.

2.3 BENCH SEATING

- A. Description: **[Plank-type seating in permanent arrangement]**<Insert description> as indicated on Drawings.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following]****[provide products by one of the following]****[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Bleachers International]**
 2. **[Dant Clayton Corporation]**
 3. **[E & D Specialty Stands, Inc.]**
 4. **[National Recreation Systems, A Playcore Company]**
 5. **[Southern Bleacher Company Inc.]**
 6. **[Sturdisteel; a division of Schultz Industries, Inc.]**
 7. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Bleachers International]**
 2. **[Dant Clayton Corporation]**
 3. **[E & D Specialty Stands, Inc.]**
 4. **[National Recreation Systems, A Playcore Company]**
 5. **[Southern Bleacher Company Inc.]**
 6. **[Sturdisteel; a division of Schultz Industries, Inc.]**

7. <Insert manufacturer's name>
- D. Seat Planks: Horizontal, continuous bench components on which spectators sit.
1. Material: One-piece **[fluted][and][contoured]** aluminum extrusion, approximately **[12 inches wide by 1-1/2 inches thick (300 mm wide by 40 mm thick)][10 inches wide by 1-1/2 inches thick (250 mm wide by 40 mm thick)]<Insert dimensions>**.
 2. Finish: **[Clear anodic][Baked-enamel or powder-coat][High-performance organic]** finish.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 3. End-Cap Finish: **[Clear anodic finish][Match seat planks]<Insert requirement>**.
- E. Backrest: Bracket mounted to underside of the seat planks.
1. Material: One-piece **[contoured]** aluminum extrusion, approximately **[5-1/2 inches high by 1-1/2 inches thick (140 mm high by 50 mm thick)]<Insert dimensions>**.
 2. Finish: **[Clear anodic][Baked-enamel or powder-coat][High-performance organic]** finish.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
 3. End-Cap Finish: **[Clear anodic finish][Match seat planks]<Insert requirement>**.
- F. Seat-Plank Support Brackets: Manufacturer's standard one-piece, **[welded-aluminum][or][welded-steel]** brackets that support and raise the seating off the supporting substrate, as indicated on Drawings.
1. Type: **[Floor-attached brackets][L-shaped, riser-mounted brackets to align back of seat plank with riser face][T-shaped, riser-mounted brackets to center the seat plank over the riser face][Z-shaped, horizontal-surface brackets]<Insert requirement>**.
 2. Finish of Visible Surfaces: **[Match seat planks]<Insert requirement>**.
- G. Backrest Brackets: Manufacturer's standard one-piece, extruded- and formed-aluminum brackets that connect the backrest to underside of the seat planks, as indicated on Drawings.
1. Provide with **[tightly fitting end caps]** and internal reinforcement, as required for secure attachment to backrest and underside of seat planks.
 2. Finish of Visible Surfaces: **[Match backrest][Match seat planks]<Insert requirement>**.
- H. Individual Seat Pads: Manufacturer's standard molded-plastic units with smoothly rolled edges, reinforcing ribs on underside to prevent deflection and strengthen attachment points, and designed for attachment to seat plank.
- I. Individual Backrest Pads: Manufacturer's standard UV-resistant, molded-plastic units with smoothly rolled edges, reinforcing ribs on underside to prevent deflection and strengthen attachment points, and designed for attachment to backrest.

2.4 ACCESSORIES

- A. Row-Letter Plates: **[Manufacturer's standard]<Insert description>**.
1. Material: Clear-anodized aluminum with black **[embossed]** characters .
 2. Location: **[As indicated on Drawings][On aisle end of seat plank]<Insert requirement>**.
 3. Attachment: **[Manufacturer's standard method][Minimum of four tamper-resistant mechanical fasteners]<Insert requirement>**.
- B. Seat-Number Plates: **[Manufacturer's standard]<Insert description>**.
1. Material: Clear-anodized aluminum with black **[embossed]** characters.
 2. Location: **[As indicated on Drawings][On top-front of individual backrest pads]<Insert requirement>**.
 3. Attachment: **[Manufacturer's standard method][Minimum of four tamper-resistant mechanical fasteners]<Insert requirement>**.
- C. Donor Plates: **[Manufacturer's standard]<Insert description>**.
1. Material: Clear-anodized aluminum with black **[embossed]** characters.
 2. Location: **[As indicated on Drawings][On top-front of individual backrest pads][On aisle end of seat plank][On aisle end of backrest]<Insert requirement>**.
 3. Attachment: **[Manufacturer's standard method][Minimum of four tamper-resistant mechanical fasteners]<Insert requirement>**.

2.5 MATERIALS

- A. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25][50]<Insert value>** percent.
- B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
- C. Steel: Hot-dip galvanized after fabrication.
- D. Molded Plastic: High-density plastic, blow or injection molded, with surface that is mar and dent resistant.
1. Color and Texture: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color and texture>**.
 2. Provide with UV inhibitors to retard fading.
- E. Fasteners: Aluminum, hot-dip galvanized steel, or stainless steel. Use fasteners of the same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.
1. Use concealed fasteners for interconnecting metal components and for attaching them to other work unless exposed fasteners are unavoidable.
 2. For exposed fasteners, use tamper-resistant screws of head profile flush with metal surface unless otherwise indicated.
 3. Finish heads of exposed fasteners to match finish of metal fastened unless otherwise indicated.
 4. Do not use power-actuated fasteners for concrete substrates.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**][**AA-M10C22A31, Class II, 0.010 mm**] or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- C. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with [**AAMA 2604**][**AAMA 2605**] and containing not less than [**50**][**70**] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.8 FABRICATION

- A. Seat-Plank Assembly: Assemble seat plank sections end to end to form continuous benches of lengths indicated on Drawings. Provide tightly fitting aluminum end caps, interior joint sleeves at splices, and welded mounting plates for attaching support[**and backrest**] brackets.
- B. Backrest Assembly: Assemble backrest sections end to end to form continuous backrest surface of lengths indicated on Drawings. Provide tightly fitting aluminum end caps, interior joint sleeves at splices, and welded mounting plates for attaching to backrest brackets.
- C. Shop-Fabricated Connections: Welded according to AWS standards by AWS-certified welders.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine floors, risers, and other adjacent work and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install seating in locations indicated and fasten to substrates according to manufacturer's written installation instructions unless otherwise indicated.

- B. Install seating level, with uniform bench height above walking surface, and without sharp edges.
- C. Attach end caps tightly abutting ends of seat planks, with exposed end-cap contour aligned with contour of seat planks.
- D. Space and attach seat-plank support brackets only to substrate concrete or structural components of metal substrates.
- E. Install individual seat and backrest pads equally spaced along length of bench seating.
- F. Install accessories in visual alignment.

3.3 ADJUSTING

- A. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.
- B. Replace damaged and malfunctioning components that cannot be acceptably repaired.

END OF SECTION 13 34 16 13



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Task	Specification	Specification Description
13 34 16 13	13 34 23 16	Fabricated Control Booths



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SECTION 13 34 19 00 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal building systems.
2. Structural-steel framing.
3. Metal roof panels.
4. Metal wall panels.
5. Foamed-insulation-core metal wall panels.
6. Metal soffit panels.
7. Thermal insulation.
8. Personnel doors and frames.
9. Horizontal sliding doors.
10. Windows.
11. Translucent panels.
12. Accessories.

B. Related Requirements:

1. Division 03 concrete Sections for anchor rod installation, concrete, reinforcement, and formwork requirements.
2. Section 077253 "Snow Guards" for devices designed to hold snow on the roof surface.
3. Section 083323 "Overhead Coiling Doors" for coiling vehicular doors in metal building systems.
4. Section 083613 "Sectional Doors" for sectional vehicular doors in metal building systems.

1.2 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.3 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Division 03 concrete Sections.
- B. Coordinate imposed load of [**cranes**] [**HVAC**] **<Insert equipment>** specified in other Sections with structural performance requirements specified in this Section.
- C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conferences: Conduct conferences [at **Project site**] [by **web conference**] <Insert location>.
1. Metal Building Systems Conference: Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
 2. Metal Building Roof Panel Conference: Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 3. Metal Building Wall Panel Conference: Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: By manufacturer of metal building systems. Indicate components by others. Include full building plan, elevations, sections, details, and the following:
1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.

2. Structural-Framing Drawings: Indicate complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - a. Indicate provisions for attaching **[mezzanines]** **[roof curbs]** **[service walkways]** **[platforms]** **[and]** **[pipe racks]**.
3. Metal Panel Layout Drawings: Indicate **[roof]** **[and]** **[wall]**. layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; indicate locations of exposed fasteners.
 - a. Indicate roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 - b. Indicate wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
 - c. Indicate translucent panels.
4. Accessory Drawings: Include details of the following items, at a scale of not less than **[1-1/2 inches per 12 inches (1:8)]** **<Insert scale>**:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
 - d. Service walkways.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.
- D. Samples for Verification: Actual sample of finished products for each type of exposed finish.
 1. Panels: **[Manufacturers' standard size]** **<Insert size>**. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: **[Manufacturers' standard size]** **<Insert size>**. Include fasteners and other exposed accessories.
 3. Vapor-Retarder Facings: Minimum 6-inch- (150-mm-) square Samples.
 4. Windows: Full-size, nominal 12-inch- (300-mm-) long frame Samples showing typical profile.
 5. Accessories: Samples for each type of accessory.
- E. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.
 1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets, indicating complete designations of every item required for each door or opening.
 2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- F. Delegated Design Submittals: For metal building systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- G. Sustainable Design Submittals:
 1. <Double click to insert sustainable design text for recycled content.>
 2. <Double click to insert sustainable design text for EPDs and HPDs.>
 3. <Double click to insert sustainable design text for roofing.>



4. <Double click to insert sustainable design text for material ingredient optimization.>
5. <Double click to insert sustainable design text for material ingredient screening and optimization action plan.>
6. <Double click to insert sustainable design text for Declare product label>

1.6 INFORMATIONAL SUBMITTALS

- A. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. Governing building code and year of edition.
 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, in accordance with governing building code.
 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- B. Welding certificates.
- C. Material Test Reports: For each of the following products, by a qualified testing agency:
 1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Tension-control, high-strength, and bolt-nut-washer assemblies.
 4. Shop primers.
 5. Nonshrink grout.
- D. Source quality control reports.
- E. Field quality control reports.
- F. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor that performed surveys certify their accuracy.
- G. Qualification Statements: For **[manufacturer]** **[erector]** **[land surveyor]** **[door inspector]**.
 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- H. Delegated Design Engineer Qualifications: For metal building system.
- I. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes[**and door hardware**].

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Component: **<Insert number>** of **[roof panels]** **[wall panels]** **<Insert components>**.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications:

1. Accreditation: Manufacturer's facility accredited in accordance with IAS AC472.
2. Engineering Responsibility: Metal building system design and preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in **[state]** **<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.

- B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in **[state]** **<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.

- C. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

- D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

- E. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M.
2. AWS D1.3/D1.3M.

- F. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies is to comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and with the following:

1. DHI Fire and Egress Door Assembly Inspector (FDAI) certification.

- G. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies is to comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and with the following:

1. DHI Fire and Egress Door Assembly Inspector (FDAI) certification.

1.10 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup as **[as indicated on Drawings]** <Insert mockup requirements>.
 - 2. Build mockups for typical wall metal panels including accessories.
 - a. Size: **[48 inches (1200 mm) long by 48 inches (1200 mm)]** <Insert dimensions>.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed in accordance with manufacturers' written installation instructions and warranty requirements.

1.13 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: **[25] [20] [10] <Insert number>** years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 1. Warranty Period: **[20] <Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated in accordance with procedures in MBMA's "Metal Building Systems Manual":
 1. Design Loads: **[As indicated on Drawings] <Insert applicable code requirement>**.
 2. Deflection and Drift Limits:
 - a. Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC's "Design Guide No. 3: Serviceability Design Considerations for Steel Buildings."
 - b. Deflection to be no greater than the following:
 - 1) Purlins and Rafters: Vertical deflection of **[1/150] [1/240] [1/360] <Insert limit>** of the span.
 - 2) Girts: Horizontal deflection of **[1/120] [1/180] [1/240] <Insert limit>** of the span.
 - 3) Metal Roof Panels: Vertical deflection of **[1/150] [1/240] [1/360] <Insert limit>** of the span.
 - 4) Metal Wall Panels: Horizontal deflection of **[1/180] [1/240] <Insert limit>** of the span.
 - 5) Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - 6) Lateral Drift: Maximum of **[1/60] [1/100] [1/200] [1/400] <Insert limit>** of the building height.
- C. Seismic Performance: Metal building system to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7] <Insert requirement>**.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces] <Insert temperature change>**.



- E. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E119 or ASTM E108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL Product iQ, FM Approvals' "Approval Guide," or from the listings of another qualified testing agency.
- F. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.
- G. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- H. Structural Performance for Metal Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
- I. Air Infiltration for Metal Roof Panels: Air leakage of not more than **[0.04 cfm/sq. ft. (0.2 L/s per sq. m)] [0.06 cfm/sq. ft. (0.3 L/s per sq. m)]** <Insert air infiltration> when tested in accordance with ASTM E1680[**or ASTM E283/E283M**] at the following test-pressure difference:
 - 1. Test-Pressure Difference: **[1.57 lbf/sq. ft. (75 Pa)] [6.24 lbf/sq. ft. (300 Pa)]**.
- J. Air Infiltration for Metal Wall Panels: Air leakage of not more than **[0.04 cfm/sq. ft. (0.2 L/s per sq. m)] [0.06 cfm/sq. ft. (0.3 L/s per sq. m)]** <Insert air infiltration> when tested in accordance with ASTM E283/E283M at the following test-pressure difference:
 - 1. Test-Pressure Difference: **[1.57 lbf/sq. ft. (75 Pa)] [6.24 lbf/sq. ft. (300 Pa)]**.
- K. Water Penetration for Metal Roof Panels: No water penetration when tested in accordance with ASTM E1646[**or ASTM E331**] at the following test-pressure difference:
 - 1. Test-Pressure Difference: **[2.86 lbf/sq. ft. (137 Pa)] [6.24 lbf/sq. ft. (300 Pa)]**.
- L. Water Penetration for Metal Wall Panels: No water penetration when tested in accordance with ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **[2.86 lbf/sq. ft. (137 Pa)] [6.24 lbf/sq. ft. (300 Pa)]**.
- M. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: **[UL 30] [UL 60] [UL 90]**.
- N. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Approvals' "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- [60] [75] [90] [105] [120] <Insert number>.
 2. Hail Resistance: [MH] [SH].
- O. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested in accordance with ASTM C1363 or ASTM C518:
1. Roof:
 - a. U-Factor: <Insert value>.
 - b. R-Value: <Insert value>.
 2. Walls:
 - a. U-Factor: <Insert value>.
 - b. R-Value: <Insert value>.

2.3 METAL BUILDING SYSTEMS

- A. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. System Description: Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
1. Primary-Frame Type:
 - a. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
 - b. Rigid Modular: Solid-member, structural-framing system with interior columns.
 - c. Truss-Frame Clear Span: Truss-member, structural-framing system without interior columns.
 - d. Truss-Frame Modular: Truss-member, structural-framing system with interior columns.
 - e. Lean-to: Solid- or truss-member, structural-framing system, designed to be partially supported by another structure.
 2. End-Wall Framing:
 - a. Manufacturer's standard, for buildings not required to be expandable, consisting of **[primary frame, capable of supporting one-half of a bay design load, and end-wall columns] [load-bearing end-wall and corner columns and rafters]**.
 - b. Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
 3. Secondary-Frame Type: Manufacturer's standard purlins and joists and **[flush-framed] [partially inset-framed] [exterior-framed (bypass)]** girts.
 4. Eave Height: **[16 ft. (4.9 m)] [20 ft. (6.1 m)] [24 ft. (7.3 m)] [28 ft. (8.5 m)] [Manufacturer's standard height, as indicated by nominal height on Drawings] <Insert dimension>**.
 5. Bay Spacing: **[20 ft. (6.1 m)] [25 ft. (7.6 m)] [30 ft. (9.1 m)] [As determined by manufacturer] [As indicated on Drawings] <Insert dimension>**.
 6. Roof Slope: **[1/4 inch per 12 inches (1:48)] [1/2 inch per 12 inches (1:24)] [1 inch per 12 inches (1:12)] [4 inches per 12 inches (1:3)] [Manufacturer's standard for frame type required] <Insert slope>**.
 7. Roof System: Manufacturer's standard **[standing-seam, vertical-rib,] [standing-seam, trapezoidal-rib,] [lap-seam, tapered-rib]** metal roof panels.

- a. Liner Panels: Tapered rib.
- 8. Exterior Wall System: Manufacturer's standard [**exposed-fastener, tapered-rib,**] [**exposed-fastener, reverse-rib,**] [**concealed-fastener, flush-profile,**] [**foamed-insulation-core**] metal wall panels.
 - a. Liner Panels: [**Tapered rib**] [**Flush profile**].

2.4 STRUCTURAL-STEEL FRAMING

- A. <Double click to insert sustainable design text for recycled content.>
- B. Structural Steel: Comply with AISC 360.
- C. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- D. Cold-Formed Steel: Comply with AISI S100 for design requirements and allowable stresses.
- E. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 - 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 - 3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 - 4. Truss-Frame, Clear-Span Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 - 5. Truss-Frame Modular Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 - 6. Long-Bay Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 - 7. Frame Configuration: [**Single gable**] [**One-directional, sloped**] [**Lean-to, with high side connected to and supported by another structure**] [**Multiple gable**] [**Load-bearing wall**] [**Multistory**].
 - 8. Exterior Column: [**Uniform depth**] [**Tapered**].
 - 9. Rafter: [**Uniform depth**] [**Tapered**].
- F. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
 - 1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.

2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- G. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
1. Purlins:
 - a. C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges.
 - b. Steel joists of depths indicated on Drawings.
 - 1) Depth: **[As indicated on Drawings] [As needed to comply with system performance requirements] <Insert dimension>**.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- (64-mm-) wide flanges.
 - a. Depth: **[As indicated on Drawings] [As required to comply with system performance requirements] <Insert dimension>**.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 4. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structural-steel angles or 1-inch- (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 5. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
 6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch (76-by-51-mm), fabricated from zinc-coated (galvanized) steel sheet.
 7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- H. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
1. Type: **[Straight-beam, eave type] [Purlin-extension type] [Tapered-beam, below-eave type] [As indicated]**.
- I. Bracing: Provide adjustable wind bracing[**using any method**] as follows:
1. Rods: ASTM A36/A36M; ASTM A572/A572M, Grade 50 (345); or ASTM A529/A529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
 2. Cable: ASTM A475, minimum 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.

4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
- J. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- K. Materials:
1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 4. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A1011/A1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A1008/A1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or HSLAS, Grades 45 through 70 (310 through 480).
 7. Metallic-Coated Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
 8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, SS, Grade 50 or 80 (340 or 550); with Class AZ50 (AZM150) coating.
 9. Joist Girders: Manufactured in accordance with "Standard Specifications for Joist Girders," in SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for primary framing.
 10. Steel Joists: Manufactured in accordance with "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.
 11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563/A563M carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.
 - a. Finish: **[Plain] [Hot-dip zinc coating, ASTM F2329, Class C] [Mechanically deposited zinc coating, ASTM B695, Class 50].**
 12. High-Strength Bolts, Nuts, and Washers, Grade A325 (Grade A325M): ASTM F3125/F3125M, Type 1, heavy-hex steel structural bolts; ASTM A563/A563M, Grade DH (Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

- a. Finish: **[Plain] [Hot-dip zinc coating, ASTM F2329, Class C] [Mechanically deposited zinc coating, ASTM B695, Class 50].**
13. High-Strength Bolts, Nuts, and Washers, Grade A490 (Grade A490M): ASTM F3125/F3125M, Type 1, heavy-hex steel structural bolts **[or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends]**; ASTM A563/A563M, Grade DH (Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
14. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, **[heavy-hex] [round]** head assemblies consisting of steel structural bolts with splined ends; ASTM A563/A563M, Grade DH (Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1 hardened carbon-steel washers.
 - a. Finish: **[Plain] [Mechanically deposited zinc coating, ASTM B695, Class 50] [Mechanically deposited zinc coating, ASTM B695, Class 50, baked-epoxy coated].**
15. Unheaded Anchor Rods: **[ASTM F1554, Grade 36] [ASTM A572/A572M, Grade 50 (345)] [ASTM A36/A36M] [ASTM A307, Grade A].**
 - a. Configuration: Straight.
 - b. Nuts: ASTM A563/A563M, **[heavy-]**hex carbon steel.
 - c. Plate Washers: ASTM A36/A36M carbon steel.
 - d. Washers: ASTM F436/F436M, hardened carbon steel.
 - e. Finish: **[Plain] [Hot-dip zinc coating, ASTM F2329, Class C] [Mechanically deposited zinc coating, ASTM B695, Class 50].**
16. Headed Anchor Rods: **[ASTM F1554, Grade 36] [ASTM A307, Grade A].**
 - a. Configuration: Straight.
 - b. Nuts: ASTM A563/A563M, **[heavy-]**hex carbon steel.
 - c. Plate Washers: ASTM A36/A36M carbon steel.
 - d. Washers: ASTM F436/F436M, hardened carbon steel.
 - e. Finish: **[Plain] [Hot-dip zinc coating, ASTM F2329, Class C] [Mechanically deposited zinc coating, ASTM B695, Class 50].**
17. Threaded Rods: **[ASTM A193/A193M] [ASTM A572/A572M, Grade 50 (345)] [ASTM A36/A36M] [ASTM A307, Grade A].**
 - a. Nuts: ASTM A563/A563M, **[heavy-]**hex carbon steel.
 - b. Washers: **[ASTM F436/F436M, hardened] [ASTM A36/A36M]** carbon steel.
 - c. Finish: **[Plain] [Hot-dip zinc coating, ASTM F2329, Class C] [Mechanically deposited zinc coating, ASTM B695, Class 50].**
- L. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
 1. Clean and prepare in accordance with SSPC-SP2.
 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.

2.5 METAL ROOF PANELS

- A. Solar Reflectance Index:

1. <Double click to insert sustainable design text for solar reflectance index.>
- B. Roof Solar Reflectance: Provide roof panels with one of the following when tested in accordance with CRRC-1:
1. Three-year, aged, solar reflectance of not less than **[0.55]** **<Insert value>** and emissivity of not less than **[0.75]** **<Insert value>**.
 2. Three-year, aged, Solar Reflectance Index (SRI) of not less than **[64]** **<Insert value>** when calculated in accordance with ASTM E1980.
- C. Standing-Seam, Vertical-Rib, Metal Roof Panels **<Insert drawing designation>**: Formed with vertical ribs at panel edges and **[intermediate stiffening ribs symmetrically spaced]** **[flat pan]** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)]** **[0.024-inch (0.61-mm)]** **[0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer]** **[Three-coat fluoropolymer]** **[Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations]** **[As selected by Architect from manufacturer's full range]** **<Insert color>**.
 2. Clips: **[One-piece fixed]** **[Two-piece floating]** to accommodate thermal movement.
 3. Joint Type: **[Panels snapped together]** **[Mechanically seamed]**.
 4. Panel Coverage: **[16 inches (406 mm)]** **<Insert dimension>**.
 5. Panel Height: **[2 inches (51 mm)]** **<Insert dimension>**.
- D. Standing-Seam, Trapezoidal-Rib, Metal Roof Panels **<Insert drawing designation>**: Formed with raised trapezoidal ribs at panel edges and **[intermediate stiffening ribs symmetrically spaced]** **[flat pan]** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)]** **[0.024-inch (0.61-mm)]** **[0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer]** **[Three-coat fluoropolymer]** **[Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations]** **[As selected by Architect from manufacturer's full range]** **<Insert color>**.
 2. Clips: **[One-piece fixed]** **[Two-piece floating]** to accommodate thermal movement.
 3. Joint Type: **[Panels snapped together]** **[Mechanically seamed]**.
 4. Panel Coverage: **[24 inches (610 mm)]** **<Insert dimension>**.
 5. Panel Height: **[3 inches (76 mm)]** **<Insert dimension>**.
 6. Uplift Rating: **[UL 30]** **[UL 60]** **[UL 90]**.
- E. Exposed Fastener, Tapered-Rib, Metal Roof Panels **<Insert drawing designation>**: Formed with raised, trapezoidal major ribs and **[intermediate stiffening ribs symmetrically spaced]** **[flat pan]** between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Major-Rib Spacing: **[6 inches (152 mm)] [12 inches (305 mm)] <Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)] <Insert dimension>**.
 4. Panel Height: **[0.75 inch (19 mm)] [1.125 inches (29 mm)] [1.188 inches (30 mm)] [1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>**.
- F. Exposed-Fastener, Tapered-Rib, Metal Liner Panels **<Insert drawing designation>**: Formed with raised, trapezoidal major ribs and **[intermediate stiffening ribs symmetrically spaced] [flat pan]** between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Major-Rib Spacing: **[6 inches (152 mm)] [12 inches (305 mm)] <Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)] <Insert dimension>**.
 4. Panel Height: **[1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>**.
- G. Finishes:
1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.6 METAL WALL PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels **<Insert drawing designation>**: Formed with raised, trapezoidal major ribs and **[intermediate stiffening ribs symmetrically spaced] [flat pan]**

between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Major-Rib Spacing: **[6 inches (152 mm)] [12 inches (305 mm)] <Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)] <Insert dimension>**.
 4. Panel Height: **[0.75 inch (19 mm)] [1.125 inches (29 mm)] [1.188 inches (30 mm)] [1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>**.
- B. Exposed-Fastener, Reverse-Rib, Metal Wall Panels **<Insert drawing designation>**: Formed with recessed, trapezoidal major valleys and **[intermediate stiffening valleys symmetrically spaced] [flat pan]** between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Fluoropolymer] [Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Major-Rib Spacing: **[12 inches (305 mm)] <Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)] <Insert dimension>**.
 4. Panel Height: **[1.125 inches (29 mm)] [1.188 inches (30 mm)] [1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>**.
- C. Concealed-Fastener, Flush-Profile, Metal Wall Panels **<Insert drawing designation>**: Formed with vertical panel edges and **[a single wide recess, centered between panel edges] [flush surface]**; with flush joint between panels; with 1-inch- (25-mm-) wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **[and factory-applied sealant]** in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Fluoropolymer] [Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Panel Coverage: **[16 inches (406 mm)] <Insert dimension>**.
 3. Panel Height: **[3 inches (76 mm)] <Insert dimension>**.
- D. Tapered-Rib, Metal Liner Panels **<Insert drawing designation>**: Formed with raised, trapezoidal major ribs and **[intermediate stiffening ribs symmetrically spaced] [flat pan]** between major ribs; designed

to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Siliconized polyester] [Acrylic enamel]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Major-Rib Spacing: **[6 inches (152 mm)] [12 inches (305 mm)] <Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)] <Insert dimension>**.
 4. Panel Height: **[1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>**.
- E. Flush-Profile, Metal Liner Panels **<Insert drawing designation>**: **[Solid] [Perforated]** panels formed with vertical panel edges and **[intermediate stiffening ribs symmetrically spaced] [flat pan]** between panel edges; with flush joint between panels; designed for interior side of metal wall panel assemblies and installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **[and factory-applied sealant]** in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Siliconized polyester] [Polyester] [Acrylic enamel]**.
 - b. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 2. Sound Absorption: NRC not less than **[0.65] [0.85] [1.00] <Insert value>** when tested in accordance with ASTM C423.
 3. Panel Coverage: **[12 inches (305 mm)] <Insert dimension>**.
 4. Panel Height: **[1.5 inches (38 mm)] <Insert dimension>**.
- F. Finishes:
1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.7 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels **<Insert drawing designation>**: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
1. Panel Thermal-Resistance Value (R-Value): **<Insert R-value>**.
 2. Facing Material: Fabricate panel with exterior and interior facings of same material and thickness. Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.024-inch (0.61-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Surface: **[Smooth, flat] [Striated] [Shallow ribs] [Shallow V grooves]**.
 - b. Exterior Finish: **[Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester]**.
 - c. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>**.
 3. Panel Coverage: **[36 inches (914 mm)] [42 inches (1067 mm)] <Insert dimension>** nominal.
 4. Panel Thickness: **[2 inches (51 mm)] [2.5 inches (64 mm)] [3 inches (76 mm)] [4 inches (102 mm)] [5 inches (127 mm)] [6 inches (152 mm)] <Insert dimension>**.
 5. Insulation Core: Modified polyisocyanurate or polyurethane foam using a non-CFC blowing agent, foamed-in-place or board type, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested in accordance with ASTM D6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested in accordance with ASTM D1622.
 - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested in accordance with ASTM D1621.
 - d. Shear Strength: 26 psi (179 kPa) when tested in accordance with ASTM C273/C273M.
 6. Fire-Test-Response Characteristics: Class A in accordance with ASTM E108.
 7. Surface-Burning Characteristics: Flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.
- B. Finishes:
1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.8 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **[and factory-applied sealant]** in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile and material of metal **[roof]** **[wall]** panels.
 1. Finish: **[Match finish and color of metal roof panels]** **[Match finish and color of metal wall panels]** **[As indicated on Drawings]**.
- C. Exposed-Fastener, Tapered-Rib-Profile, Metal Soffit Panels **<Insert drawing designation>**: Formed with raised, trapezoidal major ribs and **[intermediate stiffening ribs symmetrically spaced]** **[flat pan]** between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)]** **[0.024-inch (0.61-mm)]** **[0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Two-coat fluoropolymer]** **[Three-coat fluoropolymer]** **[Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations]** **[As selected by Architect from manufacturer's full range]** **<Insert color>**.
 2. Major-Rib Spacing: **[6 inches (152 mm)]** **[12 inches (305 mm)]** **<Insert dimension>** o.c.
 3. Panel Coverage: **[36 inches (914 mm)]** **<Insert dimension>**.
 4. Panel Height: **[0.75 inch (19 mm)]** **[1.125 inches (29 mm)]** **[1.188 inches (30 mm)]** **[1.25 inches (32 mm)]** **[1.5 inches (38 mm)]** **<Insert dimension>**.
- D. Concealed-Fastener, Flush-Profile, Metal Soffit Panels **<Insert drawing designation>**: Formed with vertical panel edges and **[a single wide recess, centered between panel edges]** **[flush surface]**; with flush joint between panels; with 1-inch- (25-mm-) wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **[and factory-applied sealant]** in side laps.
 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.024-inch (0.61-mm)]** **[0.030-inch (0.76-mm)]** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: **[Fluoropolymer]** **[Siliconized polyester]**.
 - b. Color: **[As indicated by manufacturer's designations]** **[As selected by Architect from manufacturer's full range]** **<Insert color>**.
 2. Panel Coverage: **[12 inches (305 mm)]** **[16 inches (406 mm)]** **<Insert dimension>**.
 3. Panel Height: **[1 inch (25 mm)]** **[1.5 inches (38 mm)]** **<Insert dimension>**.

2.9 THERMAL INSULATION

- A. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
- B. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

- C. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- D. Mineral-Fiber-Blanket Insulation: ASTM C665, type indicated below; consisting of fibers manufactured from glass, slag wool, or rock wool.
 - 1. Nonreflective Faced: Type II (blankets with nonreflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
 - 2. Reflective Faced: Type III (blankets with reflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
 - 3. Unfaced: Type I (blankets without membrane covering), passing ASTM E136 for combustion characteristics.
- E. Faced, Polyisocyanurate Board Insulation: ASTM C1289, Type I (foil facing), Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core. Provide units tested for interior exposure without an approved thermal barrier.
- F. Retainer Strips: For securing insulation between supports, 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- G. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested in accordance with ASTM E96/E96M, Desiccant Method.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Composition:
 - a. White metallized-polypropylene film facing, fiberglass scrim reinforcement, and kraft-paper backing.
 - b. Aluminum foil facing, elastomeric barrier coating, fiberglass scrim reinforcement, and kraft-paper backing.
 - c. White **[polypropylene] [vinyl]** film facing, fiberglass scrim reinforcement, and metallized-polyester film backing.
 - d. White polypropylene film facing and fiberglass-polyester-blend fabric backing.
- H. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.10 PERSONNEL DOORS AND FRAMES

- A. Swinging Personnel Doors and Frames:
 - 1. As specified in Section 081113 "Hollow Metal Doors and Frames."
 - 2. Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware in accordance with BHMA A156 Series.
 - a. Steel Doors: 1-3/4 inches (44.5 mm) thick; fabricated from metallic-coated steel face sheets, 0.036-inch (0.91-mm) nominal uncoated steel thickness, of **[seamed] [seamless]**, hollow-metal construction; with 0.060-inch (1.52-mm) nominal uncoated steel thickness, inverted metallic-coated steel channels welded to face sheets at top and bottom of door.
 - 1) Design: **[Flush panel] [As indicated on Drawings] <Insert design>**.

- 2) Core:
 - a) Kraft honeycomb with U-factor rating of at least 0.47 Btu/sq. ft. x h x deg F (2.67 W/sq. m x K).
 - b) Polystyrene foam with U-factor rating of at least 0.16 Btu/sq. ft. x h x deg F (0.91 W/sq. m x K).
 - c) Polyurethane foam with U-factor rating of at least 0.07 Btu/sq. ft. x h x deg F (0.40 W/sq. m x K).
- 3) Glazing Frames: Steel frames to receive field-installed glass.
- 4) Glazing: As specified in Section 088000 "Glazing."
- b. Steel Frames: Fabricate 2-inch- (51-mm-) wide face frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch (1.52-mm) nominal uncoated steel thickness.
 - 1) Type: **[Knocked down for field assembly] [Factory welded]**.
- c. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold- or hot-rolled steel sheet.
- d. Hardware:
 - 1) Provide hardware for each door leaf, as follows:
 - a) Hinges: BHMA A156.1. Three **[plain] [antifriction]**-bearing, standard-weight, full-mortise, stainless steel or bronze, template-type hinges; 4-1/2 by 4-1/2 inches (114 by 114 mm), with nonremovable pin.
 - b) Lockset: BHMA A156.2. **[Key-in-lever cylindrical] [Mortise, with lever handle]** type.
 - c) Exit Device: BHMA A156.3. Touch- or push-bar type.
 - d) Threshold: BHMA A156.21. Extruded aluminum.
 - e) Silencers: Pneumatic rubber; three silencers on strike jambs of single door frames and two silencers on heads of double door frames.
 - f) Closer: BHMA A156.4. Surface-applied, standard-duty hydraulic type.
 - g) Weather Stripping: Vinyl applied to head and jambs, with vinyl sweep at sill.
 - 2) Provide each pair of double doors with the following hardware in addition to that specified for each leaf:
 - a) Astragal: Removable type.
 - b) Surface Bolts: Top and bottom of inactive door.
- e. Anchors and Accessories: Manufacturer's standard units, galvanized in accordance with ASTM A123/A123M.
- f. Fabrication: Fabricate doors and frames to be rigid; neat in appearance; and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.

B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS, Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS, Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

C. Finishes for Personnel Doors and Frames:

1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.
 - a. Color and Gloss: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and gloss>.**

2.11 HORIZONTAL SLIDING DOORS

- A. Horizontal-Sliding Doors: Manufacturer's standard horizontal-sliding door assembly including structural frame, door panels, brackets, guides, tracks, hardware, and installation accessories.
1. Door Frames: Channels and zeeks; metallic-coated steel sheet or structural-steel shapes, 0.060-inch (1.52-mm) nominal uncoated steel thickness.
 2. Door Panels: Same material and finish as metal wall panels.
 3. Hardware: Manufacturer's standard metallic-coated steel track, bottom guides, lock angles for side closure, and brackets. Support each door leaf by two four-wheel trolleys. Provide metallic-coated steel handle for each leaf, and slide bolt or padlock hasp. Flash top of track with metallic-coated steel sheet hood.

2.12 WINDOWS

A. Aluminum Windows:

1. As specified in Section 085113 "Aluminum Windows."
2. Metal building system manufacturer's standard, with self-flashing mounting fins, and as follows:
 - a. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:
 - 1) Horizontal-Sliding Units: **[HS-LC25] [HS-CW30] <Insert designation>.**
 - 2) Single-Hung Units: **[H-LC25] [H-CW30] <Insert designation>.**
 - 3) Fixed Units: **[FW-LC25] [FW-CW30] [FW-AW40] <Insert designation>.**
 - b. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch (1.63-mm) thickness at any location for main frame and sash members.
 - 1) Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance thermal barrier; located between exterior materials and

window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

- c. Mullions: Between adjacent windows, fabricated of extruded aluminum matching finish of window units.
- d. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners are not to be exposed, except for attaching hardware.
 - 1) Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch (3.26 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
- e. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - 1) Cam-action sweep sash lock and keeper at meeting rails.
 - 2) Spring-loaded, snap-type lock at jambs.
 - 3) Pole-operated, cam-action locking device on meeting rail where rail is more than 72 inches (1830 mm) above floor.
 - 4) Lift handles for single-hung units.
 - 5) Nylon sash rollers for horizontal-sliding units.
 - 6) Steel or bronze operating arms.
- f. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric; complying with AAMA 701/702.
- g. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit, and as follows:
 - 1) Aluminum Wire Fabric: 18-by-18 (1.1-by-1.1-mm), 18-by-16 (1.1-by-1.3-mm), or 18-by-14 (1.1-by-1.5-mm) mesh of 0.013-inch- (0.3-mm-) diameter, coated aluminum wire.
 - 2) Glass-Fiber Mesh Fabric: 18-by-16 (1.1-by-1.3-mm) or 18-by-14 (1.1-by-1.5-mm) mesh of PVC-coated, glass-fiber threads, woven and fused to form a fabric mesh; complying with ASTM D3656/D3656M.
 - 3) Fabric: Manufacturer's standard aluminum wire fabric or glass-fiber mesh fabric.

B. Glazing: Comply with requirements specified in Section 088000 "Glazing."

- 1. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear), 3 mm thick.
- 2. Heat-Treated Float Glass: ASTM C1048, Type I, Quality-Q3, Class I (clear), Condition A, 3 mm thick.
- 3. Tinted Float Glass: ASTM C1036, Type I, Quality-Q3, Class 2, 3 mm thick.
 - a. Tint Color: **[Blue] [Blue-green] [Bronze] [Green] [Gray] [Manufacturer's standard color] <Insert color>.**
- 4. Patterned Glass: ASTM C1036, Type II, Quality-Q6, Class 1 (clear), Form 3, Pattern P3 (random), 3 mm thick.
- 5. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of 2.5-mm-thick clear float glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
- 6. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
 - a. Provide safety glazing labeling.



7. Glazing Stops: Screw-applied or snap-on glazing stops coordinated with Section 088000 "Glazing" and with glazing system indicated. Match material and finish of window frames.
8. Factory-Glazed Fabrication: Glaze window units in the factory to greatest extent possible and practical for applications indicated. Comply with requirements in Section 088000 "Glazing."

C. Finish:

1. Mill finish.
2. Baked-Enamel Finish, Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 0.7 mil (0.02 mm), medium gloss.
 - a. Color: **[As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>.**

2.13 TRANSLUCENT PANELS

- A. Uninsulated Translucent Panels: Glass-fiber-reinforced polyester, translucent plastic; complying with ASTM D3841, **[Type CC2 (general purpose)] [Type CC1 (limited flammability)]**, Grade 1 (weather resistant); smooth finish on both sides. Match profile of adjacent metal panels.

1. Roof Panel Weight: Not less than 8 oz./sq. ft. (2441 g/sq. m).
2. Wall Panel Weight: Not less than 6 oz./sq. ft. (1831 g/sq. m).
3. Light Transmittance: Not less than **[55] <Insert number>** percent in accordance with ASTM D1494.
4. Metal Edge: Fabricate full length of each side of panel with metal edge for seaming into standing-seam roof panel joint.
5. Color: **[White] <Insert color>.**

- B. Insulated Translucent Panels: Fabricate insulating units of two sheets of glass-fiber-reinforced polyester, translucent plastic separated by an air space; complying with ASTM D3841, Type CC1 (limited flammability), Grade 1 (weather resistant); smooth finish on both sides. Match profile of adjacent metal panels.

1. Exterior Panel Weight: Not less than **[8 oz./sq. ft. (2441 g/sq. m)] [6 oz./sq. ft. (1831 g/sq. m)]**.
2. Interior Panel Weight: Not less than **[8 oz./sq. ft. (2441 g/sq. m)] [6 oz./sq. ft. (1831 g/sq. m)] [4 oz./sq. ft. (1221 g/sq. m)]**.
3. Light Transmittance: Not less than **[42] <Insert number>** percent in accordance with ASTM D1494.
4. Metal Edge: Fabricate full length of each side of panel with metal edge for seaming into standing-seam roof panel joint.
5. Color: **[White] <Insert color>.**

- C. Mastic for Translucent Panels: Nonstaining, saturated vinyl polymer as recommended by translucent panel manufacturer for sealing laps.

D. Performance:

1. Surface-Burning Characteristics: As determined by testing identical products in accordance with ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **[25] <Insert value>** or less.
 - b. Smoke-Developed Index: **[450] <Insert value>** or less.

2.14 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from **[steel] [stainless steel]** sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from **[steel] [stainless steel sheet or nylon-coated aluminum]** sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch (25-mm) standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **[0.018-inch (0.46-mm)] [0.030-inch (0.76-mm)]** nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as

required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized in accordance with manufacturer's written instructions.

1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-ft.- (3-m-) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Service Walkways: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness, steel plank grating; with slip-resistant pattern; **[18-inch (457-mm)] [24-inch (610-mm)] [36-inch (914-mm)]** overall width. Support walkways on framing system anchored to metal roof panels without penetrating panels; with predrilled holes and clamps or hooks for anchoring.
- H. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.
1. Circular-Revolving Type: Minimum **[20-inch- (508-mm-)] <Insert dimension>** diameter throat opening; zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness, with coil coating; finished to match metal roof panels; with matching base and rain cap.
 - a. Type: **[Directional] [Stationary]** revolving.
 - b. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire; or aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.6-mm) wire.
 - c. Dampers: Spring-loaded, butterfly type; pull-chain operation; with pull chain of length required to reach within 36 inches (914 mm) of floor.
 - d. Reinforce and brace units, with joints properly formed and edges beaded to be watertight under normal positive-pressure conditions.
 - e. Mount ventilators on square-to-round bases for ridge or on-slope mounting, designed to match roof pitch and roll formed to match metal roof panel profile.
 2. Continuous or Sectional-Ridge Type: Factory-engineered and -fabricated, continuous unit; Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal roof panels. Fabricated in minimum 10-ft.- (3-m-) long sections. Provide throat size and total length indicated, complete with side baffles, ventilator assembly, end caps, splice plates, and reinforcing diaphragms.
 - a. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire; or aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.6-mm) wire.
 - b. Dampers: Manually operated, spring-loaded, vertically rising type; chain and worm gear operator; with pull chain of length required to reach within 36 inches (914 mm) of floor.
 - c. Throat Size: **[9 inches (229 mm)] [or] [12 inches (305 mm)]**, **as standard with manufacturer, and as required to comply with ventilation requirements**.
- I. Louvers: Size and design indicated; self-framing and self-flashing. Fabricate welded frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness; finished to match metal wall panels. Form blades from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.036-inch (0.91-mm) nominal uncoated steel thickness; folded or beaded at edges, set at an angle that excludes driving rains, and secured to frames by riveting or welding. Fabricate louvers with equal blade spacing to produce uniform appearance.

1. Blades:
 - a. Fixed.
 - b. Adjustable type, with weather-stripped edges, and manually operated by hand crank or pull chain.
2. Free Area: Not less than **[7.0 sq. ft. (0.65 sq. m)]** <Insert dimension> for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
3. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire; with rewirable frames, removable and secured with clips; fabricated of same kind and form of metal and with same finish as louvers.
 - a. Mounting: **[Interior] [Exterior]** face of louvers.
4. Vertical Mullions: Provide mullions at spacings recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
- J. Roof Curbs: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.
 1. Curb Subframing: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch (1.52-mm) nominal uncoated steel thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
 2. Insulation: 1-inch- (25-mm-) thick, rigid type.
- K. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- L. Materials:
 1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 2. Fasteners for Metal Roof Panels:
 - a. Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 3. Fasteners for Metal Wall Panels:
 - a. Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, **[with EPDM sealing washers bearing on weather side of metal panels]**.
 - b. Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless steel or zinc-alloy-steel hex washer head, **[with EPDM sealing washers bearing on weather side of metal panels]**.
 4. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 5. Blind Fasteners: High-strength aluminum or stainless steel rivets.
 6. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.



7. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
8. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.15 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members to be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 5. Shop Priming: Prepare surfaces for shop priming in accordance with SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming in accordance with SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.16 SOURCE QUALITY CONTROL

- A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.
 - 1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed in accordance with Contract requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted in accordance with manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system in accordance with manufacturer's written instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, in accordance with AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 2. Locate and space wall girts to suit openings such as doors and windows.
 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists[, **girders**,] and accessories plumb, square, and true to line; securely fasten to supporting construction in accordance with SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Joint Installation:
 - a. Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
 - b. Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
 - c. Weld joist seats to supporting steel framework.
 5. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 1. Tighten rod and cable bracing to avoid sag.
 - 2. Locate interior end-bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 INSTALLATION OF METAL PANELS, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate in accordance with equipment manufacturer's written instructions and to comply with details shown.
- C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Locate metal panel splices over structural supports with end laps in alignment.
 - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-

asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types used in tested assemblies meeting "Performance Requirements" Article.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 INSTALLATION OF METAL ROOF PANELS

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Install ridge **[and hip]** caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 6. Provide metal closures at **[peaks] [rake edges] [rake walls] [and]** each side of ridge **[and hip]** caps.
- C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.
1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
 2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
 4. At metal panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

- E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 INSTALLATION OF METAL WALL PANELS

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.
 - 3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
 - 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 - 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
 - 6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 7. Install screw fasteners in predrilled holes.
 - 8. Install flashing and trim as metal wall panel work proceeds.
 - 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
 - 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 - 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer[**using sealants and gaskets as required for a watertight installation**].
- C. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches (1067 mm) o.c., spaced not more than manufacturer's written instruction. Fully engage tongue and groove of adjacent insulated metal wall panels.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.
- D. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m), noncumulative; level, plumb, and on location lines; and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 INSTALLATION OF TRANSLUCENT PANELS

- A. Translucent Panels: Attach translucent panels to structural framing with fasteners in accordance with manufacturer's written instructions. Install panels perpendicular to supports unless otherwise indicated. Anchor translucent panels securely in place, with provisions for thermal and structural movement.
 - 1. Provide end laps of not less than 6 inches (152 mm) and side laps of not less than 1-1/2-inch (38-mm) corrugations for metal roof panels.

2. Provide end laps of not less than 4 inches (102 mm) and side laps of not less than 1-1/2-inch (38-mm) corrugations for metal wall panels.
3. Align horizontal laps with adjacent metal panels.
4. Seal intermediate end laps and side laps of translucent panels with translucent mastic.

3.8 INSTALLATION OF METAL SOFFIT PANELS

- A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.
- B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.9 INSTALLATION OF THERMAL INSULATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, in accordance with manufacturer's written instructions.
 1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
 4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
 1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
 2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
 3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
 - 1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
 - 2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.
- D. Board Wall Insulation: Extend board insulation in thickness indicated to cover entire wall. Hold in place by metal wall panels fastened to secondary framing. Comply with manufacturers' written instructions.
 - 1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.10 INSTALLATION OF DOORS AND FRAMES

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place in accordance with manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Personnel Doors and Frames: Install doors and frames in accordance with NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
 - 1. Between Doors and Frames at Jambs and Head: 1/8 inch (3 mm).
 - 2. Between Edges of Pairs of Doors: 1/8 inch (3 mm).
 - 3. At Door Sills with Threshold: 3/8 inch (9.5 mm).
 - 4. At Door Sills without Threshold: 3/4 inch (19.1 mm).
 - 5. At fire-rated openings, install frames in accordance with, and doors with clearances specified in, NFPA 80.
- C. Sliding Service Doors: Bolt support angles to opening head members through factory-punched holes. Bolt door tracks to support angles at maximum 24 inches (610 mm) o.c. Set doors and operating equipment with necessary hardware, jamb and head mold stops, continuous hood flashing, anchors, inserts, hangers, and equipment supports.
- D. Field Glazing: Comply with installation requirements in Section 088000 "Glazing."
- E. Door Hardware:
 - 1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's TDH-009.
 - 2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
 - 4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 079200 "Joint Sealants."

3.11 INSTALLATION OF WINDOWS

- A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place in accordance with manufacturer's written instructions. Coordinate installation

with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.

1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Set sill members in bed of sealant or with gaskets, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Mount screens directly to frames with tapped screw clips.

3.12 INSTALLATION OF ACCESSORIES

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 ft. (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
 1. Provide elbows at base of downspouts to direct water away from building.
 2. Tie downspouts to underground drainage system indicated.

- E. Circular Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Mount ventilators on flat level base. Install preformed filler strips at base to seal ventilator to metal roof panels.
- F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.
- G. Louvers: Locate and place louver units level, plumb, and at indicated alignment with adjacent work.
 - 1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
 - 2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
 - 3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of corrosion-resistant paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
 - 4. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.
- H. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- I. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Door Inspections:
 - 1. Door Inspection Agency: **[Owner will engage] [Engage]** a qualified inspector to perform inspections and to furnish reports to Architect.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
 - 4. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
 - 5. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
 - 6. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in **[NFPA 80] [and] [NFPA 101]**.
 - 7. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.14 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
- C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.
- D. Roof Ventilators and Adjustable Louvers: After completing installation, including work by other trades, lubricate, test, and adjust units to operate easily, free of warp, twist, or distortion as needed to provide fully functioning units.
 - 1. Adjust louver blades to be weathertight when in closed position.

3.15 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting:
 - 1. After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing[, **bearing plates**,] and accessories.
 - a. Clean and prepare surfaces by SSPC-SP 2 or SSPC-SP 3.
 - b. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
 - 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
 - 1. Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

- G. Louvers: Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
 - 1. Restore louvers damaged during installation and construction period so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - a. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 13 34 19 00



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Task	Specification	Specification Description
13 34 19 00	13 34 23 16	Fabricated Control Booths
13 34 23 00	13 34 23 16	Fabricated Control Booths
13 34 23 13	13 34 19 00	Metal Building Systems
13 34 23 13	13 34 23 16	Fabricated Control Booths
13 34 23 14	13 34 23 16	Fabricated Control Booths



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SECTION 13 34 23 16 - FABRICATED CONTROL BOOTHS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fabricated steel control booths.
2. Fabricated aluminum control booths.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Fabricated steel control booths.
2. Fabricated aluminum control booths.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control booths.
2. Include rated capacities, operating characteristics, and electrical characteristics, for included systems.

C. Shop Drawings: For control booths. Include plans, elevations, sections, details, accessories, and fastening and anchorage details, including mechanical fasteners.

1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates. Include location, diameter, and projection of anchor bolts required to attach control booths to foundation. Indicate post reactions at each location.

D. Samples: For each exposed product and for each color and texture specified, approximately 8-1/2 by 11 inches (215 by 280 mm) in size.

E. Samples for Initial Selection: For each type of exposed finish.

F. Samples for Verification: For each type of exposed finish in manufacturer's standard sizes.

1. Include Samples of wall panels and accessories to verify finish selection.

G. Delegated Design Submittals: For fabricated control booths, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.



1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For control booths to include in maintenance manuals.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair finish or replace control booths that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design fabricated control booths.
- B. Structural Performance: Fabricated control booths to withstand the following loads and stresses within limits and under conditions indicated in accordance with **[ASCE/SEI 7]<Insert requirement>**:
 - 1. Loads: **[As indicated on Drawings]<Insert loads>**.
- C. Seismic Performance: Fabricated control booths to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.
 - 1. Loads: **[As indicated on Drawings]<Insert loads>**.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature range>**.
- E. Ballistic Resistance: Provide components, including windows, walls, and doors, identical to those tested for compliance with requirements indicated, and as follows:
 - 1. UL Rating: **[Listed and labeled as][Level 1][Level 2][Level 3][Level 4][Level 5][Level 6][Level 7][Level 8]<Insert Level>** when tested in accordance with UL 752.
 - 2. NIJ Classification: **[Type I][Type IIA][Type II][Type IIIA][Type III][Type IV]** when tested in accordance with NIJ STD-0108.01.
- F. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 and marked for intended location and application.
- G. Safety Glazing: Comply with 16 CFR 1201, Category II.
 - 1. Safety Glazing Labeling: Permanently mark glazing with certification label of **[the SGCC][the SGCC or another certification agency acceptable to authorities having jurisdiction][or][manufacturer]**, indicating manufacturer's name, glass type, thickness, and safety glazing standard with which glass complies.

- H. Regulatory Requirements: Comply with applicable provisions in [the U.S. Department of Justice's "2010 ADA Standards for Accessible Design"] [and] [ICC A117.1].

2.2 FABRICATED STEEL CONTROL BOOTHS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Austin Mohawk and Company, Inc.]
 2. [B.I.G. Enterprises, Inc]
 3. [Delta Scientific Corporation]
 4. [Keystone Structures, Inc.]
 5. [Little Buildings, Inc.]
 6. [Panel Built, Inc.]
 7. [Par-Kut International, Inc]
 8. [Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]
 9. [United Partition Systems, Inc.]
 10. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Austin Mohawk and Company, Inc.]
 2. [B.I.G. Enterprises, Inc]
 3. [Delta Scientific Corporation]
 4. [Keystone Structures, Inc.]
 5. [Little Buildings, Inc.]
 6. [Panel Built, Inc.]
 7. [Par-Kut International, Inc]
 8. [Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]
 9. [United Partition Systems, Inc.]
 10. <Insert manufacturer's name>
- C. Building Style: [Standard square corners] [Radius corners] [Round corners] [Butt-glazed corners] [Wraparound type, with single rounded building end] [Wraparound type, with both building ends rounded] [As indicated on Drawings].
- D. Structural Framework: Fabricated from **2-by-2-by-0.075-inch (51-by-51-by-1.90-mm)** steel structural or mechanical tubing. Connect framework by welding.
- E. Sliding Doors: Top suspended from aluminum track with ball-bearing rollers; **1-3/4 inches (44 mm)** thick; tubular-frame design fabricated from [clear-anodized aluminum] [galvanized steel]; with [top half] [full height] of door glazed. Equip door with deadlock, lock support, guide hardware, and full weather stripping. Provide door on [one side] [both sides] of booth.
1. Glazing: [Fixed] [Horizontal sliding] unit with clear [insulating] <Insert glazing> glass.
 2. Deadlock: Mortised, laminated-hook bolt type with removable cylinder capable of being master keyed.
- F. Swinging Doors: **1-3/4 inches (44 mm)** thick; tubular-frame design fabricated from [clear-anodized aluminum] [galvanized steel]; with [top half] [full height] of door glazed. Equip door with deadlock, three butt hinges, closer, and full weather stripping. [Provide door on back of booth.]
1. Glazing: [Fixed] [Horizontal sliding] unit with clear [insulating] <Insert glazing> glass.

2. Deadlock: Mortised, with lever handle and removable cylinder capable of being master keyed.
- G. Windows: Extruded-aluminum sash frames glazed with clear **[tempered][insulating]<Insert glazing>** glass.
1. Frame Finish: Manufacturer's standard mill or clear anodic.
 2. Operable Windows: Equip windows with cam locks, weather stripping, and **[stainless steel][nylon]** ball-bearing rollers.
 3. Screens: **[Insect][Security]** screens for each window.
 4. Corner Shape: **[Square][Round]**.
- H. Wall Panel Assembly: Assembly consisting of exterior face panel fabricated from **0.079-inch (2.01-mm)** nominal-thickness, galvanized-steel sheet; and interior face panel fabricated from **[0.064-inch (1.63-mm)][0.052-inch (1.32-mm)]** nominal-thickness, galvanized-steel sheet; with **[2-inch- (51-mm-)][3-inch- (76-mm-)]<Insert dimension>** thick, **[rigid fiberglass][or][polystyrene board]** insulation in cavity between exterior and interior face panels.
- I. Raised Base Assembly: **[4-inch- (102-mm-)][3-inch- (76-mm-)]** high assembly consisting of perimeter frame welded to structural framework of booth. Fabricate frame from **2-by-4-inch (51-by-102-mm)** galvanized-steel structural tubing; **0.108-inch (2.74-mm)** nominal-thickness, C-shaped, galvanized-steel sheet channels; or galvanized structural-steel angles. Include anchor clips fabricated from **1/4-inch- (6-mm-)** thick galvanized-steel plate, predrilled and welded to exterior of integral floor frame.
1. Tread Plate Floor Assembly: **0.108-inch (2.74-mm)** nominal-thickness, galvanized, rolled steel tread plate.
 2. Insulated Floor Assembly: Assembly consisting of **0.079-inch (2.01-mm)** nominal-thickness, galvanized-steel sheet underside with rigid insulation core; covered by **0.125-inch- (3.18-mm-)** thick, aluminum rolled tread plate; with overall assembly thickness of **2 inches (51 mm)**.
 3. Uninsulated Floor Assembly: Assembly consisting of **[one][two]** layer(s) of **3/4-inch- (19-mm-)** thick plywood or oriented strand board with **[0.125-inch- (3.18-mm-)]** thick, **aluminum rolled tread plate][vinyl composition flooring][carpeting]**.
- J. Flush Base Assembly: No perimeter frame, with finished floor fabricated from **0.108-inch (2.74-mm)** nominal-thickness, galvanized, rolled steel tread plate.
- K. Open Base: No perimeter frame, with surface of supporting concrete base as finished floor.
- L. Flat Roof/Ceiling Assembly: Assembly consisting of exterior roof panels, interior ceiling panels, and insulation between exterior and interior panels; sloped to drain at booth perimeter.
1. Exterior Roof Panel: Fabricated from **[0.079-inch (2.01-mm)][0.064-inch (1.63-mm)]** nominal-thickness, galvanized-steel sheet; with **[painted finish][EPDM membrane]**, continuously welded seams[, and full-perimeter gutter].
 2. Interior Ceiling Panel: Fabricated from **0.079-inch (2.01-mm)** nominal-thickness, galvanized-steel sheet; with fiberglass insulation in cavity between ceiling and roof.
 3. Insulated Composite Panel: Fabricated from **0.028-inch (0.71-mm)** nominal-thickness, galvanized-steel sheet faces and expanded-foam insulation core.
 4. Canopy Fascia: Fabricated from **0.079-inch (2.01-mm)** nominal-thickness, galvanized-steel sheet, of **[manufacturer's standard design][custom design indicated on Drawings]**.
 - a. Height: **[6 inches (152 mm)][8 inches (203 mm)]<Insert dimension>**.
 - b. Configuration:
 - 1) Overhang **[3 inches (76 mm)]<Insert dimension>** beyond face of walls below.
 - 2) Flush with face of walls below.

5. Downspouts: Integral, extending **3 inches (76 mm)** beyond booth walls.
 6. Roof scuppers.
 7. Rooftop finial.
- M. Work Counters: Full width of control booth, reinforced; with **16-inch- (406-mm-)** wide **[storage][cash]** drawer below each counter and an access opening for electrical cords at **[each]** rear corner of counter.
1. Material: **[0.078-inch- (1.98-mm-) thick, stainless steel sheet][0.079-inch (2.01-mm) nominal-thickness, galvanized-steel sheet][1/2-inch- (13-mm-) thick particleboard with plastic-laminate finish]**.
 2. Depth: **[18 inches (457 mm)][20 inches (508 mm)][22 inches (559 mm)]<Insert dimension>**.
- N. Electrical:
1. Single-Point Connection: Service-entrance-rated, fused safety switch located on exterior for connection of 125 A, **[120/240 V, single-phase, three-wire][120/208 V, single-phase, three-wire][208Y/120 V, three-phase, four-wire]** feeder with equipment ground conductor.
 2. Grounding: Grounding electrode bonded to equipment ground conductor at single-point connection in accordance with NFPA 70 and Section 260526 "Grounding and Bonding for Electrical Systems."
 3. Power Distribution: Readily accessible panelboard in accordance with Section 262416 "Panelboards" installed at **[interior][exterior]** location **[coordinated with Architect]**. Include 25 percent provisions for installation of additional future devices.
 4. Power Connections:
 - a. **[One]<Insert number>** duplex, weatherproof, ground-fault circuit interrupter (GFCI), NEMA 5-15R power outlet(s) for servicing exterior equipment.
 - b. **[One][Two]<Insert number>** duplex, **[ground-fault circuit interrupter (GFCI),]** NEMA 5-15R power outlet(s) under counter(s) near access openings.
 - c. **[One][Two]<Insert number>** Type USB-A power outlet(s) above counter(s) for charging portable devices.
 - d. Provide power connections and means of disconnect for interior and exterior HVAC equipment.
 - e. Provide power connections and means of disconnect for vehicle **[and pedestrian]** control equipment.
 5. Lighting:
 - a. Booth Interior: LED. Provide **20-fc (200-lux)** average horizontal illuminance, with uniformity not exceeding 2:1 average-to-minimum **[, dimmable from 100 percent to 10 percent,]** on counter work surfaces.
 - b. Booth Exterior: LED, located above door. Provide not less than **0.5-fc (5-lux)** average horizontal illuminance, with uniformity not exceeding 3:1 maximum-to-minimum, when measured at finished grade over the distance of **15 ft. (4.5 m)** from entrance door.
 - c. Vehicle and Pedestrian Circulation:
 - 1) LZ1: LED. For drive aisles **[and pedestrian walkways]** in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **2-fc (20-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **1.5-fc (15-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
 - 2) LZ2: LED. For drive aisles **[and pedestrian walkways]** in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **1.5-fc (15-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **1-fc (10-lux)** average vertical illuminance when measured

- 3) **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
LZ3: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **1-fc (10-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **0.8-fc (8-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
 - 4) LZ4: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **0.8-fc (8-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **0.6-fc (6-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
- d. Controls: **[Provide manual switches for interior and exterior lighting on wall inside booth door][Provide automatic photocontrol for interior and exterior lighting, with manual override located on wall inside booth door].**
- O. Communications:
1. **[One]<Insert number>** communications outlet(s) under counter(s) with **[two][four]<Insert number>** TIA-1096-A miniature eight-position series jack(s) for connecting telephone and data equipment.
- P. Heating Unit: **[Wall][Roof]**-mounted, thermostatically controlled, **[110-V][230/208-V]**, electric heater with fan-forced operation and with capacity of not less than **[5000 Btu/h (1470 W)][7500 Btu/h (2200 W)]<Insert capacity>**. Enclose in enameled-steel cabinet[**and mount under work counter**].
- Q. Cooling Unit: **[Wall][Roof]**-mounted, thermostatically controlled air conditioner with cooling capacity of not less than **[10,000 Btu/h (2930 W)][12,000 Btu/h (3520 W)][13,500 Btu/h (3960 W)]<Insert capacity>**. Enclose in enameled-steel cabinet.
- R. Accessories: Provide the following for each control booth:
1. Through-wall transaction drawers[**and speaking apertures**].
 2. Antifatigue mats.
 3. Exterior stainless steel counter.
 4. **[Floor][Wall-mounted]** safe.
 5. Signage: **<Insert requirements>**.
 6. Ventilation fan.
 7. Insect screens on operable openings.
 8. Rollup shutters on doors and windows.
 9. Intercom.
 10. Traffic control lights.
 11. Bollards.
- S. Anchorage: **[Cast-in-place anchor bolts][Postinstalled anchors]** fabricated from non-ferrous or corrosion-resistant materials, with allowable load or strength design greater than or equal to the design load, as determined by testing conducted by a qualified testing agency.
- T. Materials:
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, commercial quality, **G90 (Z275)** coating designation; mill phosphatized.

2. Galvanized Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D); hot-dip galvanized in accordance with ASTM A123/A123M.
 3. Steel Structural Tubing: ASTM A500/A500M, Grade B.
 4. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 5. Steel Mechanical Tubing: ASTM A513/A513M, welded-steel mechanical tubing.
 6. Zinc-Coated (Galvanized) Steel: Hot-dip galvanized in accordance with ASTM A123/A123M.
 7. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - a. Sheet: ASTM B209/B209M.
 - b. Extruded Shapes: **ASTM B221 (ASTM B221M)**.
 - c. Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T4 or Alloy 6061-T6.
 8. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
 9. Plastic Laminate: ISO 4586-3, Grade HGS or HGL.
 10. Plywood: DOC PS 1, Exterior grade.
 11. Particleboard: ANSI A208.1, Grade M-2.
 12. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3; **[6 mm thick]<Insert thickness>**.
 13. Clear Insulating Glass: ASTM E2190. Factory-assembled units consisting of two lites of 2.5-mm-thick clear float glass, ASTM C1036, Type I, Class 1, Quality q3, and dehydrated air space, with a total overall unit thickness of **[1 inch (25 mm)][3/4 inch (19 mm)][5/8 inch (16 mm)]<Insert dimension>** and with manufacturer's standard dual seal. Provide tempered lites where indicated.
 14. Ballistic-Resistant Glazing: Tested to comply with bullet-resistant testing level indicated.
- U. Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on finish, including thermosetting, electrostatically applied, and powder coatings. Comply with coating manufacturer's written instructions for applying and baking.
1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.3 FABRICATED ALUMINUM CONTROL BOOTHS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Allied Modular Building Systems, Inc.]**
 2. **[Austin Mohawk and Company, Inc.]**
 3. **[Keystone Structures, Inc.]**
 4. **[Mardan Fabrication, Inc.]**
 5. **[NRB Modular Solutions Inc.]**
 6. **[Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]**
 7. **[Portafab Corporation]**
 8. **[Starrco]**
 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Allied Modular Building Systems, Inc.]**
 2. **[Austin Mohawk and Company, Inc.]**
 3. **[Keystone Structures, Inc.]**

4. [Mardan Fabrication, Inc.]
 5. [NRB Modular Solutions Inc.]
 6. [Porta-King Building Systems; a division of Jay Henges Enterprises, Inc.]
 7. [Portafab Corporation]
 8. [Starrco]
 9. <Insert manufacturer's name>
- C. Building Style: [Standard square corners][Radius corners][Round corners][Butt-glazed corners][Wraparound type, with single rounded building end][Wraparound type, with both building ends rounded][As indicated on Drawings].
- D. Structural Framework: Fabricated from **2-by-2-by-0.125-inch (51-by-51-by-3.18-mm)** aluminum tubing, channel, angle, or tee extrusions; with [clear][color] anodic finish. Connect framework with [exposed] mechanical fasteners.
- E. Sliding Doors: Top suspended from aluminum track with ball-bearing rollers; **1-3/4 inches (44 mm)** thick; tubular-frame design fabricated from clear-anodized aluminum; with [top half][full height] of door glazed. Equip door with deadlock, lock support, guide hardware, and full weather stripping. Provide door on [one side][both sides] of booth.
1. Glazing: [Fixed][Horizontal sliding] unit with clear [insulating]<Insert glazing> glass.
 2. Deadlock: Mortised, laminated-hook bolt type with removable cylinder capable of being master keyed.
- F. Swinging Doors: **1-3/4 inches (44 mm)** thick; tubular-frame design fabricated from clear-anodized aluminum; with [top half][full height] of door glazed. Equip door with deadlock, three butt hinges, closer, and full weather stripping. [Provide door on back of booth.]
1. Glazing: [Fixed][Horizontal sliding] unit with clear [insulating]<Insert glazing> glass.
 2. Deadlock: Mortised, with lever handle and removable cylinder capable of being master keyed.
- G. Windows: Extruded-aluminum sash frames glazed with clear [tempered][insulating]<Insert glazing> glass.
1. Frame Finish: Manufacturer's standard mill or clear anodic.
 2. Operable Windows: Equip windows with cam locks, weather stripping, and [stainless steel][nylon] ball-bearing rollers.
 3. Screens: [Insect][Security] screens for each window.
 4. Corner Shape: [Square][Round].
- H. Wall Panel Assembly: Assembly consisting of exterior face panel fabricated from [0.032-inch- (0.81-mm-)][0.063-inch- (1.60-mm-)] thick aluminum sheet, and interior face panel fabricated from [0.032-inch- (0.81-mm-)][0.050-inch- (1.27-mm-)] thick aluminum sheet; with **2-inch- (51-mm-)** thick [polystyrene][or][polyisocyanurate board insulation] in cavity between exterior and interior face panels.
- I. Raised Base Assembly: **4-inch- (102-mm-)** high assembly consisting of perimeter frame welded to structural framework of booth. Fabricate frame from **2-by-4-by-0.125-inch (51-by-102-by-3.18-mm)** aluminum tubing or aluminum angles. Include anchor clips fabricated from **1/4-inch- (6-mm-)** thick aluminum, predrilled and welded to exterior of integral floor frame.
1. Insulated Floor Assembly: Assembly consisting of **0.032-inch- (0.81-mm-)** thick, aluminum sheet underside with plywood and rigid insulation core; covered by **0.125-inch- (3.18-mm-)** thick, aluminum rolled tread plate; with overall assembly thickness of **2 inches (51 mm)**.
 2. Uninsulated Floor Assembly: Assembly consisting of [one][two] layer(s) of **3/4-inch- (19-mm-)**

thick plywood or oriented strand board with **[0.125-inch- (3.18-mm-) thick, aluminum rolled tread plate][vinyl composition flooring][carpeting]**.

- J. Open Base: No perimeter frame, with surface of supporting concrete base as finished floor.
- K. Flat Roof/Ceiling Assembly: Assembly consisting of exterior roof panels, interior ceiling panels, and insulation between exterior and interior panels; sloped to drain at booth perimeter.
 - 1. Exterior Roof Panel: Fabricated from **0.032-inch- (0.81-mm-) thick** aluminum sheet; with protective plastic sheet finish and full-perimeter gutter.
 - 2. Interior Ceiling Panel: Fabricated from **0.125-inch- (3.18-mm-) thick** hardboard; with polyisocyanurate board insulation in cavity between ceiling and roof.
 - 3. Insulated Composite Panel: Fabricated from **0.032-inch- (0.81-mm-) thick** aluminum sheet faces and expanded-foam insulation core.
 - 4. Canopy Fascia: Fabricated from **0.063-inch- (1.60-mm-) thick** aluminum sheet, of **[manufacturer's standard design][custom design indicated on Drawings]**.
 - a. Height: **[6 inches (152 mm)][8 inches (203 mm)]<Insert dimension>**.
 - b. Configuration:
 - 1) Overhang **[3 inches (76 mm)]<Insert dimension>** beyond face of walls below.
 - 2) Flush with face of walls below.
 - 5. Downspouts: Integral, extending **3 inches (76 mm)** beyond booth walls.
 - 6. Roof scuppers.
 - 7. Rooftop finial.
- L. Work Counters: Full width of control booth, reinforced; with **16-inch- (406-mm-) wide** **[storage][cash]** drawer below each counter and an access opening for electrical cords at **[each]** rear corner of counter.
 - 1. Material: **1/2-inch- (13-mm-) thick** particleboard with plastic-laminate finish.
 - 2. Depth: **[18 inches (457 mm)][20 inches (508 mm)][22 inches (559 mm)]<Insert dimension>**.
- M. Electrical Power Service:
 - 1. Single-Point Connection: Service-entrance-rated, fused safety switch located on exterior for connection of 125 A, **[120/240 V, single-phase, three-wire][120/208 V, single-phase, three-wire][208Y/120 V, three-phase, four-wire]** feeder with equipment ground conductor.
 - 2. Grounding: Grounding electrode bonded to equipment ground conductor at single-point connection in accordance with NFPA 70 and Section 260526 "Grounding and Bonding for Electrical Systems."
 - 3. Power Distribution: Readily accessible panelboard in accordance with Section 262416 "Panelboards" installed at **[interior][exterior]** location **[coordinated with Architect]**. Include 25 percent provisions for installation of additional future devices.
 - 4. Power Connections:
 - a. **[One]<Insert number>** duplex, weatherproof, ground-fault circuit interrupter (GFCI), NEMA 5-15R power outlet(s) for servicing exterior equipment.
 - b. **[One][Two]<Insert number>** duplex, **[ground-fault circuit interrupter (GFCI),]** NEMA 5-15R power outlet(s) under counter(s) near access openings.
 - c. **[One][Two]<Insert number>** type USB-A power outlet(s) above counter(s) for charging portable devices.
 - d. Provide power connections and means of disconnect for interior and exterior HVAC equipment.
 - e. Provide power connections and means of disconnect for vehicle **[and pedestrian]** control equipment.

5. Lighting:

- a. Booth Interior: LED. Provide **20-fc (200-lux)** average horizontal illuminance, with uniformity not exceeding 2:1 average-to-minimum[, **dimnable from 100 percent to 10 percent,**] on counter work surfaces.
- b. Booth Exterior: LED, located above door. Provide not less than **0.5-fc (5-lux)** average horizontal illuminance, with uniformity not exceeding 3:1 maximum-to-minimum, when measured at finished grade over the distance of **15 ft. (4.5 m)** from entrance door.
- c. Vehicle and Pedestrian Circulation:
 - 1) LZ1: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **2-fc (20-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **1.5-fc (15-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
 - 2) LZ2: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **1.5-fc (15-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **1-fc (10-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
 - 3) LZ3: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **1-fc (10-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **0.8-fc (8-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
 - 4) LZ4: LED. For drive aisles[**and pedestrian walkways**] in primary directions of travel for distance **10 ft. (3 m)** from booth, provide not less than **0.8-fc (8-lux)** average horizontal illuminance when measured **4 ft. (1.2 m)** above finished grade and not less than **0.6-fc (6-lux)** average vertical illuminance when measured **3 to 5 ft. (1 to 1.5 m)** above finished grade, with horizontal and vertical uniformities not exceeding 2:1 average-to-minimum.
- d. Controls: **[Provide manual switches for interior and exterior lighting on wall inside booth door][Provide automatic photocontrol for interior and exterior lighting, with manual override located on wall inside booth door].**

N. Communications:

1. **[One]<Insert number>** communications outlet(s) under counter(s) with **[two][four]<Insert number>** TIA-1096-A miniature eight-position series jack(s) for connecting telephone and data equipment.

O. Heating Unit: **[Wall][Roof]**-mounted, thermostatically controlled, **[110-V][230/208-V]** electric heater with fan-forced operation and with capacity of not less than **[5000 Btu/h (1470 W)][7500 Btu/h (2200 W)]<Insert capacity>**. Enclose in enameled-steel cabinet[**and mount under work counter**].

P. Cooling Unit: **[Wall][Roof]**-mounted, thermostatically controlled air conditioner with cooling capacity of not less than **[10,000 Btu/h (2930 W)][12,000 Btu/h (3520 W)][13,500 Btu/h (3960 W)]<Insert capacity>**. Enclose in enameled-steel cabinet.

Q. Accessories: Provide the following for each control booth:

1. Through-wall transaction drawers[**and speaking apertures**].
 2. Antifatigue mats.
 3. Exterior stainless steel counter.
 4. **[Floor][Wall-mounted]** safe.
 5. Signage: **<Insert requirements>**.
 6. Ventilation fan.
 7. Insect screens on operable openings.
 8. Rollup shutters on doors and windows.
 9. Intercom.
 10. Traffic control lights.
 11. Bollards.
- R. Anchorage: **[Cast-in-place anchor bolts][Postinstalled anchors]** fabricated from stainless steel, with allowable load or strength design greater than or equal to the design load, as determined by testing conducted by a qualified testing agency.
- S. Materials:
1. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - a. Sheet: ASTM B209/B209M.
 - b. Extruded Shapes: **ASTM B221 (ASTM B221M)**.
 - c. Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T4 or Alloy 6061-T6.
 2. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
 3. Plastic Laminate: ISO 4586-3, Grade HGS or HGL.
 4. Plywood: DOC PS 1, Exterior grade.
 5. Particleboard: ANSI A208.1, Grade M-2.
 6. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, and Quality q3; **[6 mm thick]<Insert thickness>**.
 7. Clear Insulating Glass: ASTM E2190. Factory-assembled units consisting of two lites of 2.5-mm-thick clear float glass, ASTM C1036, Type I, Class 1, Quality q3, and dehydrated air space, with a total overall unit thickness of **[1 inch (25 mm)][3/4 inch (19 mm)][5/8 inch (16 mm)]<Insert dimension>** and with manufacturer's standard dual seal. Provide tempered lites where indicated.
 8. Ballistic-Resistant Glazing: Tested to comply with bullet-resistant testing level indicated.
- T. Clear Anodic Finish: AAMA 611, **[AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm]** or thicker.
- U. Color Anodic Finish: AAMA 611, **[AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm]** or thicker.
1. Color: **[Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>**.
- V. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.4 FABRICATION

- A. Factory fabricate complete control booths, with accessories and options installed at factory.
- B. Factory preglaze windows and doors.
- C. Factory prewire control booths, ready for connection to service at Project site.
- D. Fabricate control booths with **[forklift pockets in base of booth][removable lifting eye centered in roof]**.
- E. Accessible Control Booths: Where indicated to be accessible, fabricate control booths as follows:
 - 1. Provide service windows located no higher than **34 inches (865 mm)** above exterior grade.
 - 2. Provide door opening with minimum **32-inch (813-mm)** clear width.
 - 3. Provide minimum **60-inch (1525-mm)** clear turning spacing within the booth.
 - 4. Provide minimum **27-inch (685-mm)** clearance beneath interior work surfaces. Locate work surfaces **28 inches (710 mm)** minimum and **34 inches (865 mm)** maximum above the floor.
 - 5. Locate controls and operable parts no lower than **15 inches (381 mm)** and no higher than **48 inches (1219 mm)** above the floor where reach is unobstructed. Where side reach is obstructed, locate controls and operable parts no lower than **15 inches (381 mm)** and no higher than **46 inches (1170 mm)** above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before control booth installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install control booths in accordance with manufacturer's written instructions.
- B. Accessible Control Booths: Install with interior floor surface at same elevation as adjacent paved surfaces.
- C. Set control booths plumb and aligned. Level baseplates true to plane, with full bearing on concrete bases.
- D. Fasten control booths securely to concrete base with anchorage indicated.
- E. Connect to electrical power service and communication systems.

- F. Perform startup checks of [heating][and][cooling] units in accordance with manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust doors, operable windows, and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.
- B. Adjust interior and exterior lighting controls.
- C. Lubricate hardware and other moving parts.
- D. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 13 34 23 16



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Task	Specification	Specification Description
13 34 23 16	11 12 00 00	Parking Control Equipment
13 34 23 31	13 34 19 00	Metal Building Systems
13 34 23 31	13 34 23 16	Fabricated Control Booths
13 42 63 16	11 98 12 00	Detention Enclosures
13 42 63 16	09 57 00 00	Security Ceiling Assemblies
13 42 63 16	12 55 00 00	Detention Furniture



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SECTION 13 46 13 00 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Lightning protection system for ordinary structures.
- B. Section Includes: Lightning protection system for the following:
 - 1. Ordinary structures.
 - 2. **<Insert one or more miscellaneous structures or special occupancies>.**

1.2 ACTION SUBMITTALS

- A. Product Data: For each product.
- B. Shop Drawings:
 - 1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
 - 2. Include raceway locations needed for the installation of conductors.
 - 3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
 - 4. Include roof attachment details, coordinated with roof installation.
 - 5. Calculations required by NFPA 780 for bonding of metal bodies.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Lightning protection cabling attachments to roofing systems and accessories.
 - 2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
 - 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 017839 "Project Record Documents."
 - b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.

B. Completion Certificate:

1. **[UL Master Label Certificate][UL Letter of Findings Limited Scope Inspection Report][LPI Master Certificate][LPI Limited Scope Certification].**

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: **[UL-listed installer, category OWAY][or][LPI Master Installer].**

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION FOR STRUCTURES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[allG Fabrication (formerly ALT)]**
2. **[East Coast Lightning Equipment Inc.]**
3. **[ERICO; brand of nVent Electrical plc]**
4. **[Harger Lightning & Grounding; business of Harger, Inc.]**
5. **[Heary Bros. Lightning Protection Co. Inc]**
6. **[Independent Protection Co]**
7. **[National Lightning Protection]**
8. **[Preferred Lightning Protection]**
9. **[Robbins Lightning, Inc]**
10. **[Thompson Lightning Protection, Inc]**
11. **[VFC Lightning Protection]**
12. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[allG Fabrication (formerly ALT)]**
2. **[East Coast Lightning Equipment Inc.]**
3. **[ERICO; brand of nVent Electrical plc]**
4. **[Harger Lightning & Grounding; business of Harger, Inc.]**
5. **[Heary Bros. Lightning Protection Co. Inc]**
6. **[Independent Protection Co]**
7. **[National Lightning Protection]**
8. **[Preferred Lightning Protection]**
9. **[Robbins Lightning, Inc]**
10. **[Thompson Lightning Protection, Inc]**

11. [VFC Lightning Protection]
12. <Insert manufacturer's name>

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for [Class I][Class II] buildings.
- B. UL Lightning Protection Standard: Comply with UL 96A requirements for [Class I][Class II] buildings.
- C. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

- A. Air Terminals:
 1. [Copper][Stainless steel][or][Aluminum] unless otherwise indicated.
 2. [3/8-inch (10-mm)][1/2-inch (12.7-mm)][5/8-inch (16-mm)] diameter by [10 inches (254 mm)][12 inches (305 mm)][15 inches (380 mm)][18 inches (450 mm)][24 inches (610 mm)]<Insert length of air terminal> long.
 3. [Pointed][Rounded] tip.
 4. [Integral base support][Threaded base support].
- B. Air Terminal Bracing:
 1. [Aluminum][Copper][Stainless steel][Galvanized steel].
 2. [1/4-inch (6-mm)]<Insert size> diameter rod.
- C. Class I Main Conductors:
 1. [Stranded Copper: 57,400 circular mils in diameter][Aluminum: 98,600 circular mils in diameter].
- D. Class II Main Conductors:
 1. [Stranded Copper: 115,000 circular mils in diameter][Aluminum: 192,000 circular mils in diameter].
- E. Secondary Conductors:
 1. [Stranded Copper: 26,240 circular mils in diameter][Aluminum: 41,400 circular mils in diameter].
- F. Ground Loop Conductor: [Stranded copper][Tinned copper].
- G. Ground Rods:
 1. Material: [Solid copper][Copper-clad steel][Stainless steel].
 2. Diameter: [5/8 inch (16 mm)][3/4 inch (19 mm)].
 3. Rods shall be not less than 120 inches (3050 mm) long.
 4. [Sectional type, with integral threads].

- H. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lightning protection components and systems according to **[UL 96A][NFPA 780]**.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and **8 inches (203 mm)** in radius and narrow loops.
- C. Conceal conductors within normal view from exterior locations at grade within **200 feet (60 m)** of building. Comply with requirements for **[concealed installations in UL 96A][concealed systems in NFPA 780]**.
 - 1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
 - 2. Install conduit where necessary to comply with conductor concealment requirements.
 - 3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.
- D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

- A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.
- B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: **[bolted connectors][exothermic weld][high compression][crimp]**.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage][Engage]** a qualified special inspector to perform the following special inspections:
 - 1. Perform inspections as required to obtain a UL Master Label for system.
 - 2. Perform inspections to obtain an LPI certification.
- B. Prepare test and inspection reports and certificates.

END OF SECTION 13 46 13 00

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SECTION 13 47 13 00 - CATHODIC PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Magnesium anodes, Type II.
2. Magnesium/manganese alloy anodes.
3. Zinc anodes for buried service, Type Z-1.
4. Permanent reference electrodes.
5. Wire and cable.
6. Test stations.
7. Sealing, potting, and dielectric compounds.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design:** Design, supervise, test, and inspect the installation of cathodic protection systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
1. Design cathodic protection for pipelines in accordance with NACE RP0169.
 2. Design cathodic protection for metal underground storage tanks in accordance with NACE RP0285.
- B. Survey site and determine soil or water corrosivity (resistivity), current requirements, potential surveys, stray currents, and water chemistry/corrosivity (pH).**
- C. Select anodes and accessories relevant to level of protection. Design anodes for an estimated life of [15][30] years before replacement.**
- D. Cathodic protection systems provide protective potential that complies with referenced NACE standards. Insulators are required if needed to insulate protected metals from other structures.**

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:** For cathodic protection. Include plans, evaluations, sections, details, and attachments to other work.
1. Detail locations of cathodic protection equipment, devices, and outlets, with characteristics and cross-references to products.
 2. Include calculations and details of anode designs.
 3. Include labeling and identifying scheme for wires, cables, and test boxes.
- C. Delegated Design Submittals:** For cathodic protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified corrosion engineer responsible for their preparation.

1. Conduct site tests necessary for design, including soil resistivity, close-interval potential surveys, testing during construction, interference testing, and training of Owner's personnel.
2. Provide system design calculations, stating the maximum recommended anode current output density, and the rate of gaseous production, if any, at that current density.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, and coordinating connections to **[piping][and][tanks]**.
- B. Professional Engineer Qualification Data: Submit evidence of current license, corporate authorization (if applicable) of the engineering business, and NACE certifications.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Basic system operation, outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown.
 2. Instructions for pipe-to-reference cell and tank-to-reference cell potential measurements and frequency of monitoring.
 3. Instructions for dielectric connections, interference and sacrificial-anode bonds; and precautions to ensure safe conditions during repair of pipe, tank or other metallic systems. Instructions are to be neatly bound.
 4. Locations of all anodes, test stations, and insulating joints.
 5. Structure-to-reference cell potentials as measured during the tests required by "Field Quality Control" Article.
 6. Recommendations for maintenance testing, including instructions for pipe-to-reference cell potential measurements and frequency of testing.
 7. Precautions to ensure safe conditions during repair of pipe system.

1.6 QUALITY ASSURANCE

- A. Corrosion Engineer Qualifications: A qualified professional engineer who has education and experience in cathodic protection of buried and submerged metal structures and has NACE accreditation or certification as a Corrosion Specialist or Cathodic Protection Specialist.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect anodes from exposure to rain and direct sunlight.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace permanent reference electrodes that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [15][30]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAGNESIUM ANODES, TYPE II

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 1. **[Corrpro Companies, Inc.]**
 2. **[Cott Manufacturing Company]**
 3. **[CPMasters, Inc.]**
 4. **[ELTECH Systems Corporation USA]**
 5. **[Farwest Corrosion Control Company]**
 6. **[Loresco International]**
 7. **[MATCOR]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Corrpro Companies, Inc.]**
 2. **[Cott Manufacturing Company]**
 3. **[CPMasters, Inc.]**
 4. **[ELTECH Systems Corporation USA]**
 5. **[Farwest Corrosion Control Company]**
 6. **[Loresco International]**
 7. **[MATCOR]**
 8. **<Insert manufacturer's name>**
- C. Comply with ASTM B843.
- D. Chemical composition as percent of weight is to be as follows:
 1. Aluminum: 0.010 maximum.
 2. Manganese: 0.50 to 1.3.
 3. Zinc: 0.05 maximum.
 4. Silicon: 0.50 maximum.
 5. Copper: 0.02 maximum.
 6. Nickel: 0.001 maximum.
 7. Iron: 0.03 maximum.
 8. Other Impurities: 0.05 each; 0.3 maximum total.
 9. Magnesium: Remainder.
- E. Anode Core: Galvanized steel with anode wire silver-soldered to the core. Connection is to be recessed and epoxy insulated for 600-V rating. Connection is to be covered with heat-shrinkable tubing, and insulation is to be extended over connection.
- F. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation in accordance with ASTM D1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.
- G. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container.

Anodes are to be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill material is to have the following chemical composition by weight:

1. Hydrated Gypsum: 75 percent.
2. Bentonite Clay: 20 percent.
3. Anhydrous Sodium Sulfate: 5 percent.

2.2 MAGNESIUM/MANGANESE ALLOY ANODES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Corrpro Companies, Inc.]**
2. **[Cott Manufacturing Company]**
3. **[CPMasters, Inc.]**
4. **[ELTECH Systems Corporation USA]**
5. **[Farwest Corrosion Control Company]**
6. **[Loresco International]**
7. **[MATCOR]**
8. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Corrpro Companies, Inc.]**
2. **[Cott Manufacturing Company]**
3. **[CPMasters, Inc.]**
4. **[ELTECH Systems Corporation USA]**
5. **[Farwest Corrosion Control Company]**
6. **[Loresco International]**
7. **[MATCOR]**
8. **<Insert manufacturer's name>**

- C. Chemical composition as percent of weight is to be as follows:

1. Aluminum: 0.01 maximum.
2. Manganese: 0.50 to 1.3.
3. Copper: 0.02 maximum.
4. Nickel: 0.001 maximum.
5. Iron: 0.03 maximum.
6. Other Impurities: 0.05 each; 0.3 maximum total.
7. Magnesium: Remainder.

- D. Bare Anode Weight: **40 lb (18 kg)**, not including core, and a nominal length of **60 inches (1520 mm)**.

- E. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation in accordance with ASTM D1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.

- F. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container. Anodes are to be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill

material is to have the following chemical composition by weight:

1. Hydrated Gypsum: 75 percent.
2. Bentonite Clay: 20 percent.
3. Anhydrous Sodium Sulfate: 5 percent.

2.3 ZINC ANODES FOR BURIED SERVICE, TYPE Z-1

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Corrpro Companies, Inc.]**
2. **[Cott Manufacturing Company]**
3. **[CPMasters, Inc.]**
4. **[ELTECH Systems Corporation USA]**
5. **[Farwest Corrosion Control Company]**
6. **[Loresco International]**
7. **[MATCOR]**
8. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Corrpro Companies, Inc.]**
2. **[Cott Manufacturing Company]**
3. **[CPMasters, Inc.]**
4. **[ELTECH Systems Corporation USA]**
5. **[Farwest Corrosion Control Company]**
6. **[Loresco International]**
7. **[MATCOR]**
8. **<Insert manufacturer's name>**

- C. Comply with ASTM B418, Type II.

- D. Chemical composition as percent of weight is to be as follows:

1. Aluminum: 0.005 maximum.
2. Cadmium: 0.003 maximum.
3. Iron: 0.0014 maximum.
4. Zinc: Remainder.

- E. Bare Anode Ingot Weight: **30 lb (13.6 kg), 2 inches (50 mm)** square and **30 inches (760 mm)** long. Packaged weight of anode bag is to be **70 lb (32 kg)**.

- F. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation in accordance with ASTM D1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.

- G. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container. Anodes are to be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill material is to have the following chemical composition by weight:

1. Hydrated Gypsum: 75 percent.

2. Bentonite Clay: 20 percent.
3. Anhydrous Sodium Sulfate: 5 percent.

2.4 PERMANENT REFERENCE ELECTRODES

- A. **[Copper/copper sulfate (Cu/CuSO₄)]<Insert type>**, suitable for direct burial. Electrode is to be guaranteed by supplier for **[15][30]<Insert number>** years' service in the installed environment.

2.5 WIRE AND CABLE

- A. Anode Header Cable: Single-conductor, Type HMWPE, insulated cable specifically designed for direct-buried dc service in cathodic protection installations.
 1. Conductor: Stranded, annealed, uncoated copper, not less than No. 8 AWG, complying with ASTM B3 and ASTM B8.
 2. Insulation: High-molecular-weight polyethylene, complying with NEMA WC 70/ICEA S-95-658.
 3. Minimum Average Thickness of Insulation: **110 mils (2.8 mm)** for Nos. 8 through 2 AWG, and **125 mils (3.2 mm)** for Nos. 1 through 4/0 AWG; rated at 600 V.
 4. Connectors: **[Copper-compression type][or][exothermic welds]**.
- B. Conductors and Cables: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 1. Bonding Conductors for Joint and Continuity Bonds: Not less than No. 8 AWG, stranded, Type THWN copper conductors.
 2. Flexible Pipe Coupling Bonds: Flexible copper straps with electrical resistance equal to No. 1/0 AWG stranded copper wire and with five holes for five exothermic welds to pipe.
 3. Test Wires: No. 12 AWG, Type THWN copper conductors.
 4. Resistance Wires: No. 16 or No. 22 AWG nickel-chromium wire.
 5. Cables for Installation in Conduit: Type THWN copper conductors.

2.6 TEST STATIONS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Corrpro Companies, Inc.]**
 2. **[Cott Manufacturing Company]**
 3. **[CPMasters, Inc.]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Corrpro Companies, Inc.]**
 2. **[Cott Manufacturing Company]**
 3. **[CPMasters, Inc.]**
 4. **<Insert manufacturer's name>**
- C. Plastic Test Stations: Flush-mounted type, manufactured of high-impact-resistant PVC or polycarbonate

with watertight conduit connections and cover and removable terminal board having at least five terminals.

D. Test Station Mounting Enclosures:

1. Non-Traffic-Area Boxes: Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems."
2. Traffic-Area Boxes: Comply with requirements in Section 260543 "Underground Ducts and Raceways for Electrical Systems." Boxes are to have cast-iron covers with a welded bead legend "CP TEST."

2.7 SEALING, POTTING, AND DIELECTRIC COMPOUNDS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[3M]**
2. **[Chase Corporation - Chase Specialty Coatings]**
3. **[Farwest Corrosion Control Company]**
4. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[3M]**
2. **[Chase Corporation - Chase Specialty Coatings]**
3. **[Farwest Corrosion Control Company]**
4. **<Insert manufacturer's name>**

C. Sealing and Dielectric Insulating Compound: Comply with NACE RP0188. Black, rubber based, soft, permanently pliable, tacky, moldable, and unbacked; **[0.125 inch (3 mm)][0.5 inch (13 mm)]** thick.

D. Potting Compound: Comply with NACE RP0188. Cast-epoxy, two-package type; fabricated for this purpose and covered with heat-shrinkable tape.

E. Pressure-Sensitive, Vinyl-Plastic Electrical Tape: Comply with UL 510.

2.8 EXOTHERMIC WELDING MATERIALS

A. Exothermic Weld Kits: Specifically designed by manufacturer for welding materials and shapes required.

B. Exothermic Weld Caps: Dome of high-density polyethylene, **10-mil (0.254-mm)** minimum thickness, filled with mastic and containing a tunnel portion to separate lead wire from exothermic weld.

2.9 COATING REPAIR MATERIALS

A. Touchup Coating Materials: Comply with requirements in Section 099600 "High-Performance Coatings" for coating systems for touchup of factory-applied coatings.

B. Adhesive-Applied Coating Materials: Coating materials are to be compatible with factory-applied coating system.

1. Nominal thickness of coating materials is to be not less than [8 mils (0.2 mm)][16 mils (0.4 mm)][24 mils (0.6 mm)][40 mils (1.0 mm)][60 mils (1.5 mm)]<Insert value>, plus or minus 5 percent.
2. Coating materials are to be one of the following supplied by factory-applied coating system manufacturer:
 - a. Polyvinyl-chloride, pressure-sensitive, adhesive tape.
 - b. High-density polyethylene/bituminous rubber compound tape.
 - c. Butyl rubber tape.
 - d. Coal-tar epoxy.
 - e. <Insert coating material>.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS, GENERAL

- A. Comply with ANSI/IEEE C2 and NFPA 70.
- B. Make connections to ferrous pipe[**and metal tanks**] using exothermic welding.
- C. Coat welds with the coating repair material and apply an exothermic weld cap.

3.2 INSTALLATION OF MAGNESIUM ANODES, TYPE II

- A. Install magnesium anodes at locations that clear obstructions. Install at least **36 inches (900 mm)** and no more than **10 feet (3 m)** from pipe[**or tank**] to be protected. Install in augered holes with top of anode [**24 inches (600 mm) below pipe invert elevation**][**a minimum of 36 inches (900 mm) below finished grade**]. In soils that will collapse into augered holes, use casing of galvanized sheet steel.
- B. Install anodes in a dry condition after plastic or waterproof protective covering has been completely removed from water-permeable permanent container that houses anode metal. Do not use anode-connecting wire for lowering anode into hole. Backfill annular space around anode with fine earth in **6-inch (150-mm)** layers; compact each layer using hand tools. Do not strike anode or connecting wire during backfilling and compacting. After backfilling and compacting to within **6 inches (150 mm)** of finished grade, pour approximately **5 gal. (20 L)** of water into each filled hole. After water has been absorbed by earth, complete backfilling to finished level.
- C. If rock strata are encountered before achieving specified augured hole depth, install anodes horizontally at depth at least as deep as bottom of pipe to be protected.
- D. Install anodes spaced as indicated, [**directly connected**][**connected through a test station**] to the pipeline, allowing slack in connecting wire to compensate for movement during backfill operation.
- E. For tank protection, connect groups of anodes to collector cable. Make contact, through a test station, with tank to be protected.
- F. Do not use resistance wires to reduce current output of individual or group anodes.

3.3 INSTALLATION OF MAGNESIUM/MANGANESE ALLOY ANODES

- A. Install magnesium anodes at locations that clear obstructions. Install at least **36 inches (900 mm)** and no more than **10 feet (3 m)** from pipe **[or tank]** to be protected. Install in augered holes with top of anode **[24 inches (600 mm) below pipe invert elevation][a minimum of 36 inches (900 mm) below finished grade]**. In soils that will collapse into augered holes, use casing of galvanized sheet steel.
- B. Install anodes in a dry condition after plastic or waterproof protective covering has been completely removed from water-permeable permanent container that houses anode metal. Do not use anode-connecting wire for lowering anode into hole. Backfill annular space around anode with fine earth in **6-inch (150-mm)** layers; compact each layer using hand tools. Do not strike anode or connecting wire during backfilling and compacting. After backfilling and compacting to within **6 inches (150 mm)** of finished grade, pour approximately **5 gal. (20 L)** of water into each filled hole. After water has been absorbed by earth, complete backfilling to finished level.
- C. If rock strata are encountered before achieving specified augured hole depth, install anodes horizontally at depth at least as deep as bottom of pipe to be protected.
- D. Install anodes spaced as indicated, **[directly connected][connected through a test station]** to the pipeline, allowing slack in connecting wire to compensate for movement during backfill operation.
- E. For tank protection, connect groups of anodes to collector cable. Make contact, through a test station, with tank to be protected.
- F. Do not use resistance wires to reduce current output of individual or group anodes.

3.4 INSTALLATION OF ZINC ANODES FOR BURIED SERVICE, TYPE Z-1

- A. Install zinc anode horizontally in a hole at least **3 inches (76 mm)** larger than anode. Install anode under new copper water tubing, including service lines, blowoffs, and air releases. Separate piping and anode by at least **24 inches (600 mm)**, but not more than **60 inches (1520 mm)**.
- B. Install anode midway between both ends of piping. Install anode wire in piping trench and connect to piping at an accessible location. Install anode wire in PVC conduit where rising out of the ground to the aboveground connection.

3.5 INSTALLATION OF PERMANENT REFERENCE ELECTRODES

- A. Install directly beneath the buried metallic component being protected.

3.6 INSTALLATION OF WIRE AND CABLE

- A. Install conductors, except anode wires, in PVC conduit with waterproof PVC junction boxes. Comply with requirements in Section 260533.13 "Conduit for Electrical Systems" for conduit and its installation.
- B. Anode Wire Installation: Cover trench bottom for the anode wire with **3-inch (76-mm)** layer of sand or stone-free earth. Center wire on backfill layer and do not stretch or kink the conductor. Place backfill over wire in layers not exceeding **6 inches (150 mm)** deep, and compact each layer. Use clean fill, free from roots, vegetable matter, and refuse. Place cable underground-line warning tape within **18 inches (460 mm)** of finished grade, above cable and conduit.
- C. Bonding Conductors: Install conductors on metallic pipe and tanks, to and across buried flexible

couplings, mechanical joints, and flanged joints except at places where insulating joints are specified. Welded and threaded joints are considered electrically continuous and do not require bonding.

1. Install at least two bonds between parts requiring bonding.
2. Bonding conductors must contain sufficient slack for anticipated movement between structures. Bonding conductors across pipe joints are to have not less than a **4-inch (100-mm)** slack for pipe expansion, contraction, and soil stress.
3. Connect bonding conductors to pipe, coupling follower rings and coupling middle ring or sleeve. Connect bonding conductors with exothermic welds.

D. For wire splicing, use compression connectors or exothermic welds.

3.7 INSTALLATION OF TEST STATIONS

A. Install test stations as follows:

1. At **1000-foot (300-m)** intervals.
2. At insulating joints.
3. At both ends of casings when casing material is included in the cathodic protection system.
4. Where pipe crosses other metal pipes.
5. Where pipe connects to existing piping system.
6. Where pipe connects to dissimilar metal pipe.
7. At each tank component.

B. Install test stations on backfill complying with requirements for trench bottom fill for anode wires unless otherwise indicated.

C. Terminate test conductors on terminal boards and install a spare set of test leads at each testing location.

3.8 INSTALLATION OF PIPE JOINTS

A. Insulating Flange Sets: Cover flanges with sealing and dielectric compound.

B. Insulating Unions: Install electrical isolation at each building entrance and at other locations indicated on approved Delegated Design Drawings. Cover unions with sealing and dielectric compound.

3.9 INSTALLATION OF INSULATING PIPE SLEEVES

A. Install insulating sleeves between metallic piping and metal buildings, hangers, supports, and other metal structures. Completely surround the metallic pipe for the full length of the steel contact and effectively prevent contact between the cathodically protected metallic pipe and other metallic structures. Support insulating sleeve to prevent damage to coating and to accommodate relative movement, vibrations, and temperature differentials.

3.10 DISSIMILAR METALS

A. Underground Dissimilar Piping: Coat insulating joint and pipe at joints of dissimilar piping material with sealing and dielectric compound for a minimum distance of 10 pipe diameters on both sides of joint.

- B. Underground Dissimilar Valves: Coat dissimilar ferrous valves and pipe with sealing and dielectric compound for a minimum distance of 10 pipe diameters on both sides of valve.
- C. Aboveground Dissimilar Pipe and Valves: If dissimilar metal pipe joints and valves are not buried and are exposed only to atmosphere, coat connection or valve, including pipe, with sealing and dielectric compound for a minimum distance of three pipe diameters on both sides of junction.

3.11 COATINGS

- A. Field Joints: Apply adhesive-applied coating system in a thickness to achieve corrosion protection equal to adjacent factory-applied coating.

3.12 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify anode wires and anode header cables with marker tape.
 - 2. Identify underground wires and cables with underground-line warning tape.
 - 3. Identify text boxes with engraved, laminated acrylic or melamine label, permanently attached to text box.

3.13 FIELD QUALITY CONTROL

- A. Comply with NACE RP0169 and NACE RP0285.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Tests and Inspections: Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**:
 - 1. Static Pull Test: Choose, at random, one completed anode of each type for this destructive test. Demonstrate that anode wire connections have enough strength to withstand a minimum tensile load of **300 lb (136 kg)**. If test fails, replace all anodes and repeat test at another randomly selected anode.
 - 2. Insulation Testing: Before anode system is connected to **[pipe][and][tank]**, test insulation at each insulating joint and fitting. Demonstrate that no metallic contact, or short circuit, exists between the two insulated sections of **[pipe][and][tank]**. Replace defective joints or fittings.
 - 3. Bonding Tests: Test for electrical continuity across all bonded joints. Repair or add additional bonds until electrical continuity is achieved.
 - 4. Baseline Potentials: After backfilling of **[pipe and][pipe, tank, and]** anodes is completed, but before anodes are connected to **[pipe][and][tank]**, measure the static potential of **[pipe][and][tank]** to soil. Record initial measurements.
 - 5. Anode Output: Measure electrical current as anodes or groups of anodes are connected to **[pipe][and][tank]**. Use a low-resistance ammeter. Record current, date, time, and location of each measurement.
 - 6. Reference Electrode Potential Measurements: On completion of installation of entire cathodic protection system, make electrode potential measurements of **[pipe][and][tank]** in accordance with NACE RP0169, using a copper/copper-sulfate reference electrode and a potentiometer-voltmeter, or a dc voltmeter with an internal resistance (sensitivity) of not less than 100,000 ohms

per volt and a full scale of 1 or 2 V. Make measurements at same locations as those used for baseline potentials. Record voltage, date, time, and location of each measurement, using one of the following two methods:

- a. 0.85 V Negative Voltage: With cathodic system in operation, measure a negative voltage of at least minus 0.85 V between **[pipe][or][tank]** and a saturated copper/copper-sulfate reference electrode contacting the earth directly over **[pipe][or][tank]**.
 - b. 100-mV Polarization Voltage: Determine polarization voltage shift by interrupting protective current and measuring polarization decay. An immediate voltage shift will occur if protective current is interrupted. Use voltage reading, after immediate shift, as base reading from which to measure polarization decay. Measure at least a minimum polarization voltage shift of 100 mV between **[pipe][or][tank]** and a saturated copper/copper-sulfate reference electrode contacting the earth directly over **[pipe][or][tank]**.
- E. Location of Measurements for Piping: For coated piping or conduit, measure from reference electrode in contact with the earth directly over pipe. Measure at intervals not exceeding **400 feet (120 m)**. Make additional measurements at each distribution service riser, with reference electrode placed directly over service line.
- F. Location of Measurements for Tanks: For underground tanks, measure from reference electrode located as follows:
1. Directly over center of tank.
 2. At a point directly over tank and midway between each pair of anodes.
 3. At each end of tank.
- G. Interference Testing: Test interference with cathodic protection from any foreign **[pipes][and][tanks]** in cooperation with Owner of foreign **[pipes][and][tanks]**. Report results and recommendations.
- H. Stray Current Measurements: Perform at each test station. Mitigate stray currents due to lightning or overhead ac power transmission lines as provided for in NACE standards.
- I. Inspect coatings; comply with NACE RP0188. Repair imperfections of factory-applied coatings as specified in "Coatings" Article.
1. Use electronic holiday detectors to detect coating imperfections.
 2. All damage to the protective coating during transit and handling is to be repaired before installation.
 3. Repair factory-applied coatings to have equal or better corrosion resistance than the factory-applied coating system. Field-repair material is to be of the type approved by, and is to be applied as recommended by, manufacturer of the coating material.
- 3.14 ADJUSTING
- A. Adjust cathodic current using resistors as recommended by corrosion engineer who prepared the Delegated Design Submittal in Part 1.
- B. During the first year after Substantial Completion, test, inspect, and adjust cathodic protection system every three months to ensure its continued compliance with specified requirements.



3.15 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain cathodic protection system.

END OF SECTION 13 47 13 00



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Task	Specification	Specification Description
13 47 13 13	13 47 13 00	Cathodic Protection
13 47 13 16	13 47 13 00	Cathodic Protection



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SECTION 13 49 00 00 - RADIATION PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lead sheet, strip, and plate.
2. Lead bricks.
3. Borated polyethylene sheets.
4. High-density concrete blocks.
5. Lead-lined gypsum board.
6. Lead-lined softwood plywood.
7. Lead glass.
8. Lead glazing plastic.
9. Lead-lined hollow-metal doors.
10. Lead-lined hollow-metal frames.
11. Lead-lined flush wood doors.
12. Lead-lined split-core wood doors.
13. Lead-lined modular shielding partitions.
14. Informational signs.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete floor topping over lead shielding in concrete slabs.
2. Section 055000 "Metal Fabrications" for steel framing members for bracing [**lead-brick**][**and**][**high-density concrete block**] wall shielding.

1.2 DEFINITIONS

A. Lead Equivalence: The thickness of lead that provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions.

1. Lead equivalence specified for materials used in diagnostic x-ray rooms is as measured at 100 kV unless otherwise indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [**Project site**]<Insert location>.

1. Review methods and procedures related to radiation protection, including, but not limited to, the following:
 - a. Sequence and schedule of radiation protection work in relation to other work.
 - b. Supplementary lead shielding at duct, pipe, and conduit penetrations of radiation protection.
 - c. Methods of attaching other construction and equipment to lead-lined finishes.
 - d. Notification procedures for work that requires modifying radiation protection.

- e. Requirements for field quality control.
- f. <Insert agenda items>.

2. <Insert requirements>.

1.4 ACTION SUBMITTALS

A. Product Data:

- 1. Lead sheet, strip, and plate.
- 2. Lead bricks.
- 3. Borated polyethylene sheets.
- 4. High-density concrete blocks.
- 5. Lead-lined gypsum board.
- 6. Lead-lined softwood plywood.
- 7. Lead glass.
- 8. Lead glazing plastic.
- 9. Lead-lined hollow-metal doors.
- 10. Lead-lined hollow-metal frames.
- 11. Lead-lined flush wood doors.
- 12. Lead-lined split-core wood doors.
- 13. Lead-lined modular shielding partitions.
- 14. Informational signs.

B. Product Data Submittals:

- 1. Doors and Frames: Include construction details, material descriptions, core descriptions, [**fire-resistance ratings**],[**temperature-rise ratings**,] and finishes.

C. Sustainable Design Submittals:

- 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 6. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
- 7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

D. Shop Drawings: Show layout of radiation-protected areas, indicating lead thickness or lead equivalence of components. Show components and installation conditions not fully dimensioned or detailed in product data.

- 1. Show ducts, pipes, conduit, and other objects that penetrate radiation protection; include details of penetrations.
- 2. Show details of joints between radiation protection materials.
- 3. Show details of securing [**lead bricks**][**and**][**high-density concrete blocks**] to structure.
- 4. Include door details, including elevations, frame dimensions and profile, [**glazed light**],[**louver cutouts**,]and clearances and undercuts.

- E. Samples: For units with factory-applied color finishes.
- F. Product Schedule: For **[observation windows and]**doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For assemblies with radiation protection materials, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Miscellaneous metal members that support **[lead bricks][and][high-density concrete blocks]**.
 - 2. Items penetrating radiation protection materials, including the following:
 - a. Electrical services.
 - b. Air outlets and inlets.
 - c. Sprinklers.
 - d. Access panels.
 - e. **<Insert item>**.
- B. Sample Warranty: For warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Lead-Lined Gypsum Panels and Plywood: Store inside under cover, and keep dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- B. Lead-Lined, Hollow-Metal Doors and Frames: Comply with requirements in Section 081113 "Hollow Metal Doors and Frames" for delivery, storage, and handling.
- C. Lead-Lined Wood Doors: Comply with requirements in Section 081416 "Flush Wood Doors" for delivery, storage, and handling.

13 - Special Construction

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install radiation protection until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

- A. Warranty for Lead-Lined Wood Doors: Comply with requirements in Section 081416 "Flush Wood Doors."

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of radiation protection product from single source from single manufacturer[**unless otherwise indicated**].

2.2 PERFORMANCE REQUIREMENTS

- A. Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and in all directions equivalent to materials specified in thicknesses and locations indicated.
- B. Materials, thicknesses, and configurations of radiation protection products indicated are based on radiation protection design prepared by Owner's radiation health physicist. This design is available to Contractor upon request.
- C. Lead-Lined Assemblies: Unless otherwise indicated, provide lead thickness in lead-lined assemblies of not less than lead thickness indicated for assemblies in which they are installed.
- D. Lead Glazing: Unless otherwise indicated, provide lead equivalence of not less than that indicated for assembly in which glazing is installed.
- E. Fire-Rated and Smoke-Control Door and Frame Assemblies: Comply with [Section 081113 "Hollow Metal Doors and Frames"]**[and][Section 081416 "Flush Wood Doors"]**<Insert requirements>.

2.3 LEAD SHEET, STRIP, AND PLATE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[A&L Shielding Inc.]**
 - 2. **[ABM Lead Corporation]**
 - 3. **[El Dorado Metals, Inc]**
 - 4. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - 5. **[Mayco Industries]**

6. [MediRay]
7. [NELCO Worldwide]
8. [New Shield, Inc.]
9. [Pitts Little Corporation]
10. [Radiation Protection Products, Inc]
11. [Ray-Bar Engineering Corp]
12. [Ultraray Radiation Protection]
13. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [El Dorado Metals, Inc]
4. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
5. [Mayco Industries]
6. [MediRay]
7. [NELCO Worldwide]
8. [New Shield, Inc.]
9. [Pitts Little Corporation]
10. [Radiation Protection Products, Inc]
11. [Ray-Bar Engineering Corp]
12. [Ultraray Radiation Protection]
13. <Insert manufacturer's name>

C. Lead Sheet, Strip, and Plate: ASTM B749, Alloy UNS No. L51121 (chemical-copper lead).

2.4 LEAD BRICKS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [El Dorado Metals, Inc]
4. [Global Partners in Shielding, Inc.]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [Mayco Industries]
7. [MediRay]
8. [NELCO Worldwide]
9. [New Shield, Inc.]
10. [Pitts Little Corporation]
11. [Radiation Protection Products, Inc]
12. [Ray-Bar Engineering Corp]
13. [Ultraray Radiation Protection]
14. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [El Dorado Metals, Inc]



4. [Global Partners in Shielding, Inc.]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [Mayco Industries]
7. [MediRay]
8. [NELCO Worldwide]
9. [New Shield, Inc.]
10. [Pitts Little Corporation]
11. [Radiation Protection Products, Inc]
12. [Ray-Bar Engineering Corp]
13. [Ultraray Radiation Protection]
14. <Insert manufacturer's name>

- C. Lead Bricks: Cast- or extruded-lead bricks with interlocking tongue and grooves or wedge-shape edges, made from pig lead complying with ASTM B29 with 0.5 percent antimony added.

2.5 BORATED POLYETHYLENE SHEETS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [A&L Shielding Inc.]
2. [Accurate Radiation Shielding, Inc.]
3. [El Dorado Metals, Inc]
4. [Global Partners in Shielding, Inc.]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [NELCO Worldwide]
7. [Pitts Little Corporation]
8. [Ultraray Radiation Protection]
9. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [Accurate Radiation Shielding, Inc.]
3. [El Dorado Metals, Inc]
4. [Global Partners in Shielding, Inc.]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [NELCO Worldwide]
7. [Pitts Little Corporation]
8. [Ultraray Radiation Protection]
9. <Insert manufacturer's name>

- C. Borated Polyethylene Sheets: High-density polyethylene containing not less than **[5][30]** percent boron.

1. Color: **[As selected by Architect from manufacturer's standard selection]<Insert color>**.

2.6 HIGH-DENSITY CONCRETE BLOCKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [El Dorado Metals, Inc]
2. [Global Partners in Shielding, Inc.]
3. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
4. [Pitts Little Corporation]
5. [Ultraray Radiation Protection]
6. [Veritas Medical Solutions]
7. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [El Dorado Metals, Inc]
2. [Global Partners in Shielding, Inc.]
3. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
4. [Pitts Little Corporation]
5. [Ultraray Radiation Protection]
6. [Veritas Medical Solutions]
7. <Insert manufacturer's name>

C. High-Density Concrete Blocks: High-density cast concrete blocks with curved or wedge-shaped interlocking edges for dry-stack installation; [145 lb/cu. ft. (2320 kg/cu. m)][250 lb/cu. ft. (4000 kg/cu. m)][300 lb/cu. ft. (4800 kg/cu. m)]<Insert density> density.

2.7 LEAD-LINED GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [Accurate Radiation Shielding, Inc.]
4. [El Dorado Metals, Inc]
5. [Global Partners in Shielding, Inc.]
6. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
7. [Mayco Industries]
8. [NELCO Worldwide]
9. [New Shield, Inc.]
10. [Pitts Little Corporation]
11. [Radiation Protection Products, Inc]
12. [Ray-Bar Engineering Corp]
13. [Ultraray Radiation Protection]
14. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [Accurate Radiation Shielding, Inc.]
4. [El Dorado Metals, Inc]
5. [Global Partners in Shielding, Inc.]
6. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
7. [Mayco Industries]
8. [NELCO Worldwide]

9. [New Shield, Inc.]
10. [Pitts Little Corporation]
11. [Radiation Protection Products, Inc]
12. [Ray-Bar Engineering Corp]
13. [Ultraray Radiation Protection]
14. <Insert manufacturer's name>

- C. Lead-Lined Gypsum Board: **5/8-inch- (15.9-mm-)** thick gypsum board complying with Section 092900 "Gypsum Board," of width and length required for support spacing and to prevent cracking during handling, and with a single sheet of lead laminated to the back of the board.

1. Lead Sheet Lining: Full width **[and length of board][of board and length necessary to extend from floor to 84 inches (2134 mm) above floor][of board and height as indicated on Drawings].** **[Extend lead sheet lining 1 inch (25.4 mm) beyond one vertical edge of board.]**
2. Furnish **[2-inch- (50-mm-)]<Insert dimension>** wide lead strips for backing joints.
3. Furnish finishing materials, accessories, and trim for lead-lined gypsum board complying with Section 092900 "Gypsum Board."

2.8 LEAD-LINED SOFTWOOD PLYWOOD

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [A&L Shielding Inc.]
2. [Accurate Radiation Shielding, Inc.]
3. [El Dorado Metals, Inc]
4. [General Veneer Manufacturing Co]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [Mayco Industries]
7. [NELCO Worldwide]
8. [New Shield, Inc.]
9. [Pitts Little Corporation]
10. [Radiation Protection Products, Inc]
11. [Ray-Bar Engineering Corp]
12. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [Accurate Radiation Shielding, Inc.]
3. [El Dorado Metals, Inc]
4. [General Veneer Manufacturing Co]
5. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
6. [Mayco Industries]
7. [NELCO Worldwide]
8. [New Shield, Inc.]
9. [Pitts Little Corporation]
10. [Radiation Protection Products, Inc]
11. [Ray-Bar Engineering Corp]
12. <Insert manufacturer's name>

- C. Lead-Lined Softwood Plywood: DOC PS 1, Exposure 1; **[fire-retardant-treated]**with touch-sanded C-

plugged veneer on face to receive lead lining. [5/8-inch- (15.9-mm-)] [3/4-inch- (19-mm-)] <Insert thickness> thick plywood of width and length required for support spacing, with a single sheet of lead laminated to the back of the panel.

1. Lead Sheet Lining: Full width [and length of panel] [of panel and length necessary to extend from floor to 84 inches (2133 mm) above floor] [of panel and height as indicated on Drawings]. [Extend lead sheet lining 1 inch (25.4 mm) beyond one vertical edge of panel.]
2. Furnish [2-inch- (50-mm-)] <Insert dimension> wide lead strips for backing joints.
3. Certified Wood: Wood products shall be certified as "FSC Pure" [or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
4. Certified Wood: Wood products shall be certified as "FSC Pure" [or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
5. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
6. Certified Wood: Wood products shall [contain not less than 60 percent] [be made from] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
7. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

2.9 LEAD GLASS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]
3. [Accurate Radiation Shielding, Inc.]
4. [Amerope Enterprises, Inc]
5. [El Dorado Metals, Inc]
6. [Global Partners in Shielding, Inc.]
7. [Hot Cell Services Corporation]
8. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
9. [Mayco Industries]
10. [McGrory Glass, Inc]
11. [NELCO Worldwide]
12. [New Shield, Inc.]
13. [Pitts Little Corporation]
14. [Radiation Protection Products, Inc]
15. [Ray-Bar Engineering Corp]
16. [Schott North America, Inc.]
17. [Ultraray Radiation Protection]
18. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A&L Shielding Inc.]
2. [ABM Lead Corporation]

3. [Accurate Radiation Shielding, Inc.]
4. [Amerope Enterprises, Inc]
5. [El Dorado Metals, Inc]
6. [Global Partners in Shielding, Inc.]
7. [Hot Cell Services Corporation]
8. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
9. [Mayco Industries]
10. [McGrory Glass, Inc]
11. [NELCO Worldwide]
12. [New Shield, Inc.]
13. [Pitts Little Corporation]
14. [Radiation Protection Products, Inc]
15. [Ray-Bar Engineering Corp]
16. [Schott North America, Inc.]
17. [Ultraray Radiation Protection]
18. <Insert manufacturer's name>

C. Lead Glass: Lead-barium, polished glass containing not less than 60 percent heavy metal oxides, including not less than 48 percent lead oxide by weight.

1. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
2. Tempered Safety Glass: ASTM C1048, Kind FT (fully tempered), lead glass with thickness [as needed to provide lead equivalence indicated][as indicated]<Insert thickness>.
3. Laminated Safety Glass: ASTM C1172 lead glass with thickness [as needed to provide lead equivalence indicated][as indicated]<Insert thickness> laminated with polyvinyl butyral interlayer to clear float glass on [one side][both sides]of lead glass.

2.10 LEAD GLAZING PLASTIC

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
2. [Mayco Industries]
3. [NELCO Worldwide]
4. [Ultraray Radiation Protection]
5. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
2. [Mayco Industries]
3. [NELCO Worldwide]
4. [Ultraray Radiation Protection]
5. <Insert manufacturer's name>

C. Lead Glazing Plastic: Transparent acrylic sheet impregnated with an organolead compound and containing 30 percent lead by weight.

1. Thickness: [As needed to provide lead equivalence indicated][As indicated]<Insert thickness>.

2.11 LEAD-LINED HOLLOW-METAL DOORS

- A. Lead-Lined Hollow-Metal Doors: Steel doors complying with NAAMM-HMMA 861, except as indicated.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A&L Shielding Inc.]**
 - b. **[Accurate Radiation Shielding, Inc.]**
 - c. **[DCI Hollow Metal on Demand]**
 - d. **[Deronde Products]**
 - e. **[El Dorado Metals, Inc]**
 - f. **[Global Partners in Shielding, Inc.]**
 - g. **[Karpen Steel Custom Doors & Frames]**
 - h. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - i. **[NELCO Worldwide]**
 - j. **[New Shield, Inc.]**
 - k. **[Pitts Little Corporation]**
 - l. **[Ray-Bar Engineering Corp]**
 - m. **[Republic Doors and Frames; a Allegion brand]**
 - n. **[Security Metal Products; a brand of ASSA ABLOY]**
 - o. **[Ultraray Radiation Protection]**
 - p. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A&L Shielding Inc.]**
 - b. **[Accurate Radiation Shielding, Inc.]**
 - c. **[DCI Hollow Metal on Demand]**
 - d. **[Deronde Products]**
 - e. **[El Dorado Metals, Inc]**
 - f. **[Global Partners in Shielding, Inc.]**
 - g. **[Karpen Steel Custom Doors & Frames]**
 - h. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - i. **[NELCO Worldwide]**
 - j. **[New Shield, Inc.]**
 - k. **[Pitts Little Corporation]**
 - l. **[Ray-Bar Engineering Corp]**
 - m. **[Republic Doors and Frames; a Allegion brand]**
 - n. **[Security Metal Products; a brand of ASSA ABLOY]**
 - o. **[Ultraray Radiation Protection]**
 - p. **<Insert manufacturer's name>**
 3. Provide single continuous sheet of lead of thickness **[not less than that required for partition in which door is installed][as indicated on Drawings]<Insert thickness>** extending from top to bottom and edge to edge, supported by hat-channel stiffeners. Do not weld stiffeners through lead lining.
 4. Line-inverted channels at top and bottom of doors with lead sheet of same thickness used in door and close with filler channels to provide flush top and bottom edges.
 5. Shield cutouts for locksets with lead sheet of same thickness used in door. Overlap lining of cutouts with lining of door by **1 inch (25 mm)**.
 6. Prepare doors to receive **[glazed lights][and][louvers]**; Factory cut and trim openings through

- doors. Furnish removable stops for glazed openings.
- 7. Furnish lead-lined astragals for pairs of doors.
- 8. Factory fit doors to suit frame-opening sizes indicated with **[1/16-inch (1.6-mm)]<Insert dimension>** clearance at heads and jambs and minimum clearance at bottom.
- 9. Finish: Apply manufacturer's **[standard primer immediately after cleaning and pretreating][factory-applied paint]**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.
- B. Metal Frames for Glazed Lights: Lead-lined frame formed of **0.048-inch- (1.2-mm-)** thick, cold-rolled steel sheet; **[factory primed for paint][with baked-enamel- or powder-coated]** finish[; and approved for use in doors of fire-protection rating indicated].
- C. Lead Door Louvers: Louvers with **[20][30]<Insert number>** percent free area made from formed-lead sheet or lead extrusions of not less than lead thickness required for door in which louver is installed. Fabricate louvers to be lightproof with fixed maze-type blades that maintain required lead equivalence at all points and in all directions. Fit and assemble louvers in doors at factory.

2.12 LEAD-LINED HOLLOW-METAL FRAMES

- A. Hollow-Metal Frames: Steel frames complying with NAAMM-HMMA 861, except as indicated.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A&L Shielding Inc.]**
 - b. **[ABM Lead Corporation]**
 - c. **[Accurate Radiation Shielding, Inc.]**
 - d. **[DCI Hollow Metal on Demand]**
 - e. **[Deronde Products]**
 - f. **[El Dorado Metals, Inc]**
 - g. **[Global Partners in Shielding, Inc.]**
 - h. **[Karpen Steel Custom Doors & Frames]**
 - i. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - j. **[NELCO Worldwide]**
 - k. **[New Shield, Inc.]**
 - l. **[Pioneer Industries; AADG, Inc.; ASSA ABLOY]**
 - m. **[Pitts Little Corporation]**
 - n. **[Radiation Protection Products, Inc]**
 - o. **[Ray-Bar Engineering Corp]**
 - p. **[Republic Doors and Frames; a Allegion brand]**
 - q. **[Security Metal Products; a brand of ASSA ABLOY]**
 - r. **[Ultraray Radiation Protection]**
 - s. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A&L Shielding Inc.]**

- b. [ABM Lead Corporation]
 - c. [Accurate Radiation Shielding, Inc.]
 - d. [DCI Hollow Metal on Demand]
 - e. [Deronde Products]
 - f. [El Dorado Metals, Inc]
 - g. [Global Partners in Shielding, Inc.]
 - h. [Karpen Steel Custom Doors & Frames]
 - i. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
 - j. [NELCO Worldwide]
 - k. [New Shield, Inc.]
 - l. [Pioneer Industries; AADG, Inc.; ASSA ABLOY]
 - m. [Pitts Little Corporation]
 - n. [Radiation Protection Products, Inc]
 - o. [Ray-Bar Engineering Corp]
 - p. [Republic Doors and Frames; a Allegion brand]
 - q. [Security Metal Products; a brand of ASSA ABLOY]
 - r. [Ultraray Radiation Protection]
 - s. <Insert manufacturer's name>
- 3. Provide knocked down frames **[where indicated][and][where installed in existing partitions]**.
 - 4. Provide borrowed lite observation window frames of split or telescoping design with welded corners, allowing frame to be installed after construction of partition.
 - a. Construct so lead lining overlaps glazing material perimeter by at least **3/8 inch (9.5 mm)**, and furnish removable stops.
 - b. Form sill with an opening for sound transmission. Offset sound passage to make opening lightproof and to maintain required lead equivalence at all points and in all directions.
 - 5. Provide **[door][and][observation window]** frames from steel sheet with minimum thickness of **0.0667 inch (1.7 mm)**.
 - 6. Furnish with additional reinforcements and internal supports to adequately carry the weight of lead-lined doors. Install reinforcements and supports before installing lead lining.
 - 7. Line frame with lead sheet of thickness not less than that required for doors and walls where frames are used. Form lead sheet to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Fabricate lead lining wide enough to maintain an effective lap with lead of adjacent shielding.
 - 8. Finish: Apply manufacturer's **[standard primer immediately after cleaning and pretreating][factory-applied paint]**.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>**.

2.13 LEAD-LINED FLUSH WOOD DOORS

- A. Lead-Lined Flush Wood Doors: Solid-core wood doors with lead sheet laminated to each side of core, with faces applied over lead lining.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [A&L Shielding Inc.]
 - b. [Accurate Radiation Shielding, Inc.]

- c. [General Veneer Manufacturing Co]
- d. [Lambton Doors]
- e. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
- f. [Masonite Architectural]
- g. [Oshkosh Door Company]
- h. [Poncraft Door Company]
- i. [Radiation Protection Products, Inc]
- j. [Ray-Bar Engineering Corp]
- k. [Ultraray Radiation Protection]
- l. [Vancouver Door Company]
- m. [VT Industries, Inc.]
- n. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [A&L Shielding Inc.]
- b. [Accurate Radiation Shielding, Inc.]
- c. [General Veneer Manufacturing Co]
- d. [Lambton Doors]
- e. [MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]
- f. [Masonite Architectural]
- g. [Oshkosh Door Company]
- h. [Poncraft Door Company]
- i. [Radiation Protection Products, Inc]
- j. [Ray-Bar Engineering Corp]
- k. [Ultraray Radiation Protection]
- l. [Vancouver Door Company]
- m. [VT Industries, Inc.]
- n. <Insert manufacturer's name>

- 3. Construction: Hot pressed, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before applying lead lining and faces.
- 4. Core: [Mineral][Particleboard][Structural composite lumber].
- 5. Lead Lining: Continuous sheets of lead extending from top to bottom and edge to edge; with total lead thickness [not less than that required for partition in which door is installed][as indicated on Drawings]<Insert thickness>.
- 6. Wood Veneer Faces: Wood veneer applied to crossbands over core.

- a. Comply with Section 081416 "Flush Wood Doors" for veneer species, grade, and matching; finishing; and other requirements unless otherwise indicated.

- 7. Plastic-Laminate Faces: High-pressure decorative laminate complying with ISO 4586-3, [Grade HGS][Grade HDS]; applied to crossbands over core.
- 8. ANSI/WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

- B. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
- C. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.
- D. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be

certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.

- E. Certified Wood: Wood products shall **[contain not less than 60 percent][be made from]** certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
- F. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
 - 1. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 2. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 - 4. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 - 5. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 6. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - 7. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 8. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 9. Adhesives: Do not use adhesives that contain urea formaldehyde.
 - 10. Adhesives: Do not use adhesives that contain urea formaldehyde.
- G. Lead Door Louvers: Louvers with **[20][30]<Insert number>** percent free area, made from formed-lead sheet or lead extrusions of not less than lead thickness required for door in which louver is installed. Fabricate louvers to be lightproof with fixed maze-type blades that maintain required lead equivalence at all points and in all directions. Factory fit and assemble louvers in doors.
- H. Prepare doors to receive **[glazed lights][and][louvers]**; factory cut and trim openings through doors.**[Provide removable wood stops for glazed lights.]**
- I. Metal Frames for Glazed Lights: Lead-lined frame formed of **0.048-inch- (1.2-mm-)** thick, cold-rolled steel sheet; **[factory primed for paint][with baked-enamel- or powder-coated]** finish; **and approved for use in doors of fire-protection rating indicated]**.
- J. Shield cutouts for locksets with lead sheet of same thickness used in door. Lap lining of cutouts with door lining.
- K. Furnish lead-lined astragals for pairs of doors.

- L. Factory fit doors to suit frame openings indicated with **[1/16-inch (1.6-mm)]<Insert dimension>** clearance at heads and jambs and minimum clearance at bottom. Factory machine doors for hardware not surface applied.

2.14 LEAD-LINED SPLIT-CORE WOOD DOORS

- A. Lead-Lined Split-Core Wood Doors: Solid-core wood doors with lead lining in center of core; with lead thickness **[not less than that required for partition in which door is installed][as indicated on Drawings]<Insert thickness>**.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A&L Shielding Inc.]**
 - b. **[ABM Lead Corporation]**
 - c. **[Accurate Radiation Shielding, Inc.]**
 - d. **[Ampco by AJW]**
 - e. **[El Dorado Metals, Inc]**
 - f. **[Global Partners in Shielding, Inc.]**
 - g. **[NELCO Worldwide]**
 - h. **[New Shield, Inc.]**
 - i. **[Pitts Little Corporation]**
 - j. **[Radiation Protection Products, Inc]**
 - k. **[Ray-Bar Engineering Corp]**
 - l. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A&L Shielding Inc.]**
 - b. **[ABM Lead Corporation]**
 - c. **[Accurate Radiation Shielding, Inc.]**
 - d. **[Ampco by AJW]**
 - e. **[El Dorado Metals, Inc]**
 - f. **[Global Partners in Shielding, Inc.]**
 - g. **[NELCO Worldwide]**
 - h. **[New Shield, Inc.]**
 - i. **[Pitts Little Corporation]**
 - j. **[Radiation Protection Products, Inc]**
 - k. **[Ray-Bar Engineering Corp]**
 - l. **<Insert manufacturer's name>**
 - 3. Construction: Split core with lead lining in center of core; bonded (vertical and horizontal edging is bonded to core). Assemble lead lining and core with poured-lead fasteners or steel bolts. Space fasteners not more than **1-1/2 inches (38 mm)** from door edge and about **8 inches (200 mm)** o.c. Countersink bolt heads and cover with lead.
 - 4. Core: **[Mineral][Particleboard][Structural composite lumber]**.
 - 5. Lead Lining: Provide continuous sheet of lead extending from top to bottom and edge to edge; with total lead thickness **[not less than that required for partition in which door is installed][as indicated on Drawings]<Insert thickness>**.
 - 6. Wood Veneer Faces: Wood veneer applied to crossbands over core.

- a. Comply with Section 081416 "Flush Wood Doors" for veneer species, grade, and matching; finishing; and other requirements unless otherwise indicated.
7. Plastic-Laminate Faces: High-pressure decorative laminate complying with ISO 4586-3, [**Grade HGS**][**Grade HDS**]; applied to crossbands over core.
8. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
9. Certified Wood: Wood products shall be certified as "FSC Pure"[or "**FSC Mixed Credit**"] according to FSC STD-01-001 and FSC STD-40-004.
10. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.
11. Certified Wood: Wood products shall [**contain not less than 60 percent**][**be made from**] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."
12. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
13. Composite Wood Products: Products shall be made without urea formaldehyde.
14. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
15. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
16. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
17. Composite Wood Products: Products shall be made without urea formaldehyde.
18. Adhesives: Do not use adhesives that contain urea formaldehyde.
19. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
20. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
21. Adhesives: Do not use adhesives that contain urea formaldehyde.
22. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. Lead Door Louvers: Louvers with [**20**][**30**]**<Insert number>** percent free area, made from formed-lead sheet or lead extrusions of not less than lead thickness required for door in which louver is installed. Fabricate louvers to be lightproof with fixed maze-type blades that maintain required lead equivalence at all points and in all directions. Factory fit and assemble louvers in doors.
- C. Prepare doors to receive [**glazed lights**][**and**][**louvers**]; factory cut and trim openings through doors.[**Provide removable wood stops for glazed lights.**]

- D. Metal Frames for Glazed Lights: Lead-lined frame formed of **0.048-inch- (1.2-mm-)** thick, cold-rolled steel sheet; **[factory primed for paint][with baked-enamel- or powder-coated]** finish[; **and approved for use in doors of fire-protection rating indicated]**.
- E. Shield cutouts for locksets with lead sheet of same thickness used in door. Lap lining of cutouts with door lining.
- F. Furnish lead-lined astragals for pairs of doors.
- G. Factory fit doors to suit frame openings indicated with **[1/16-inch (1.6-mm)]<Insert dimension>** clearance at heads and jambs and minimum clearance at bottom. Factory machine doors for hardware not surface applied.

2.15 LEAD-LINED MODULAR SHIELDING PARTITIONS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Accurate Radiation Shielding, Inc.]**
 - 2. **[Amerope Enterprises, Inc]**
 - 3. **[Global Partners in Shielding, Inc.]**
 - 4. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - 5. **[New Shield, Inc.]**
 - 6. **[Radiation Protection Products, Inc]**
 - 7. **[Ray-Bar Engineering Corp]**
 - 8. **[S&S Technology]**
 - 9. **[Ultraray Radiation Protection]**
 - 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Accurate Radiation Shielding, Inc.]**
 - 2. **[Amerope Enterprises, Inc]**
 - 3. **[Global Partners in Shielding, Inc.]**
 - 4. **[MarShield Custom Radiation Shielding Products, a division of Mars Metal Company]**
 - 5. **[New Shield, Inc.]**
 - 6. **[Radiation Protection Products, Inc]**
 - 7. **[Ray-Bar Engineering Corp]**
 - 8. **[S&S Technology]**
 - 9. **[Ultraray Radiation Protection]**
 - 10. **<Insert manufacturer's name>**
- C. Lead-Lined Modular Shielding Partitions: Partial-height modular partitions assembled from factory-finished standard components consisting of lead-lined, steel or aluminum framing members; lead-lined opaque panels; lead glass or glazing plastic vision panels; and hardware necessary for assembly and for securing to other construction. Fabricate opaque panels from honeycomb-core metal panels with polyurethane paint finish.
 - 1. Lead Equivalence for Opaque Panels: **[1/16 inch (1.6 mm)]<Insert thickness>**.
 - 2. Lead Equivalence for Framing Members: **[1/16 inch (1.6 mm)]<Insert thickness>**.
 - 3. Lead Equivalence for Vision Panels: **[1/16 inch (1.6 mm)]<Insert thickness>**.
 - 4. Color of Panels and Framing: **[As indicated by manufacturer's designations][Match**

Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.16 INFORMATIONAL SIGNS

- A. Panel Signs: Comply with Section 101423 "Panel Signage."
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Provide copy indicated or as directed.
 - 3. Indicate lead equivalence in millimeters and heights of radiation protection in **inches (millimeters)**.
- B. High-Pressure-Laminate Signs: High-pressure laminate engraving stock with contrasting face and core, machine engraved from master templates for accurately formed letters, numbers, and symbols.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Provide copy indicated or as directed.
 - 3. Indicate lead equivalence in millimeters and heights of radiation protection in **inches (millimeters)**.
- C. Rooms Where the Level of Protection Is Uniform Throughout: Provide one sign for each room indicating lead equivalence of partitions, ceilings, floors, doors, and other portions of radiation protection enclosure. Indicate height of radiation protection above floor, or indicate that partitions are radiation protected to full height.
- D. Rooms Where the Level of Protection Is Not Uniform Throughout: Provide one sign for each room with different lead equivalences in different locations. Indicate, in tabular form, lead equivalence of each wall, partition, ceiling, floor, door, and window. Indicate height of radiation protection above floor, or indicate that partitions are radiation protected to full height. Indicate where lead equivalence changes or is not continuous.
- E. Rooms Where Some Partitions Are without Radiation Protection: Provide one sign for each partition that contains radiation protection, and indicate its lead equivalence. Indicate height of radiation protection above floor, or indicate that partitions are radiation protected to full height.
- F. Rooms Where Only the Door Has Radiation Protection: Provide one sign for each door indicating its lead equivalence.
- G. Mounting: Provide manufacturer's standard [**two-faced tape**][or][**adhesive**].

2.17 DOOR AND DOOR FRAME FABRICATION

- A. Hardware Preparation: Factory prepare doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with door hardware schedule and templates furnished, as specified in [**Section 087100 "Door Hardware."**][**Section 087111 "Door Hardware (Descriptive Specification)."**]

2.18 MISCELLANEOUS MATERIALS

- A. Glazing Compounds, Gaskets, and Accessories: Comply with requirements in Section 088000 "Glazing."

- B. Accessories and Fasteners: Manufacturer's standard fasteners and accessories as required for installation, maintaining same lead equivalence as rest of system.
- C. Asphalt Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Asphalt Felt: ASTM D226/D226M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates with Installer present for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF LEAD SHEET, STRIP, AND PLATES

- A. Proceed with installation only after concrete surfaces are clean, dry, and free of depressions and sharp projections that could damage or penetrate lead sheet.
- B. Coat concrete surfaces with asphalt emulsion before installing lead sheet.
- C. Lead Sheet, 1/8 Inch (3.18 mm) Thick or Less: Install in a single layer with a **2-inch (50-mm)** minimum lap at joints.
- D. Lead Sheet More Than 1/8 Inch (3.18 mm) Thick: Install in two or more layers with a **2-inch (50-mm)** minimum lap at joints, or in a single layer with joints butted and covered with a **4-inch- (100-mm-)** wide lead strip of same thickness.
- E. Extend lead sheet at least **12 inches (300 mm)** beyond radiation shielding in walls of treatment room.
- F. In floor slabs above shielded rooms, where lead sheet is indicated, extend lead sheet at least **12 inches (300 mm)** beyond radiation shielding in walls of room below.
- G. At door openings, extend lead sheet at least **12 inches (300 mm)** beyond radiation protection in walls and at least **12 inches (300 mm)** beyond door opening on both sides[, **except where lead-lined thresholds are provided**].
- H. After installation, apply [**one coat**][**two coats**] of asphalt emulsion on top surface of lead sheet and protect from damage until concrete topping is placed.

3.3 INSTALLATION OF LEAD BRICKS

- A. Remove projections from concrete surfaces to receive lead bricks, and apply one layer of asphalt felt to prevent contact between lead bricks and concrete.
 - 1. At recesses in concrete floors to receive lead bricks, turn up asphalt felt at perimeter of recess.
- B. Install lead bricks to dimensions indicated, tightly fitted together, with joints offset in succeeding courses.

Cut bricks neatly at joints with adjacent materials for a snug fit, with edges straight and true and at right angles.

- C. Secure lead bricks to structure, as indicated on approved Shop Drawings.

3.4 INSTALLATION OF HIGH-DENSITY CONCRETE BLOCKS

- A. Dry-stack blocks in running bond, using methods recommended in writing by high-density concrete block manufacturer.
- B. Install concrete blocks to dimensions indicated, tightly fitted together, with joints offset in succeeding courses. Cut neatly at joints with adjacent materials for a snug fit, with edges straight and true and at right angles.
- C. Secure concrete blocks to structure, as indicated on approved Shop Drawings.

3.5 INSTALLATION OF LEAD-LINED GYPSUM BOARD

- A. Install and finish lead-lined gypsum board in accordance with Section 092900 "Gypsum Board."
- B. Install lead-lined gypsum board panels with long edge parallel to supports and lead lining facing supports. Provide blocking at end joints.[**Install using construction adhesive and supplementary fasteners.**]
- C. Install lead-lined gypsum board panels in sequence, so lead lining that extends beyond edge of gypsum board is covered by next panel installed.
- D. At joints where lead lining does not extend beyond edge of gypsum board panels, install lead strips **2 inches (50 mm)** wide and same thickness as lead lining to face of framing and blocking. Secure lead strips with construction adhesive.
- E. Provide shims at face of supports and blocking, where lead lining does not overlap, to provide a uniform plane across panel surfaces.
- F. Fasten lead-lined gypsum board to framing, with steel drill screws spaced as recommended in writing by lead-lined gypsum board manufacturer.
- G. Two-Layer System: Apply a facing sheet of gypsum board vertically over base sheet, using laminating adhesive recommended in writing by gypsum board manufacturer. Offset joints in finish layer from joints in base layer, and fasten at top and bottom of sheet to support finish panel until adhesive has set.
- H. Openings: Extend lead-lined gypsum board into frames of openings, lapping lead lining with lead frames or frame linings at least **1 inch (25 mm)**. Arrange board around openings, so neither horizontal nor vertical joints occur at corners of openings.
- I. Install control and expansion joints where indicated, with appropriate trim accessories. Install lead strip on face of framing, extending across joint, and lap with lead lining of gypsum board.

3.6 INSTALLATION OF LEAD-LINED SOFTWOOD PLYWOOD

- A. Install fastener shields to framing before installing lead strips at joints.

- B. Install lead strips **2 inches (50 mm)** wide and same thickness as lead lining to face of framing and blocking. Secure lead strips with construction adhesive.
- C. Provide shims at face of supports and blocking, where lead lining does not overlap, to provide a uniform, plane across panel surfaces.
- D. Install lead-lined plywood panels with long edge parallel to supports and lead lining facing supports. Provide blocking at end joints. Fasten lead-lined plywood panels to framing, with adhesive and steel drill screws spaced as recommended in writing by panel manufacturer.

3.7 INSTALLATION OF LEAD-LINED DOORS AND DOOR FRAMES

- A. Install lead-lined steel [**doors**][**and**][**door frames**] in accordance with Section 081113 "Hollow Metal Doors and Frames."
 - 1. Apply a coat of asphalt mastic or paint to lead lining in door frames where lead comes in contact with masonry or concrete.
- B. Install lead-lined wood doors in accordance with Section 081416 "Flush Wood Doors."
- C. Lead-Lined Hollow-Metal Door Frames: Comply with ANSI/NAAMM-HMMA 840 unless otherwise indicated. Except for frames located in existing walls or partitions, place frames before constructing walls. Set frames accurately in position, plumb, and brace securely until permanent anchors are set.
 - 1. Provide three anchors per jamb, located adjacent to hinge on hinge jamb and at corresponding heights on strike jamb.
 - 2. In masonry construction, use wire or T-strap anchors, and apply a coat of asphalt mastic or paint to lead lining where lead comes in contact with masonry or grout.
 - 3. In metal stud construction, use wall anchors attached to studs with screws.
 - 4. In wood stud construction, use strap anchors attached to studs with screws.
- D. Lead-Lined Split-Frame Observation Windows: Install lead-lined hollow-metal frames with split or telescoping design, with leaded side of frame on radiation side of wall.
- E. Lap lead lining of frames over lining in walls at least **1 inch (25 mm)**.
- F. Lead Lining of Frames: Line inside of frames with lead of thickness of not less than that required in doors and walls where frames are used. Form lead to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Lap lining over lining in walls at least **1 inch (25 mm)**.
- G. Install leaded side of frame on radiation side of wall. Lap lead lining of frames over lining in walls at least **1 inch (25 mm)**.
- H. Lead Glazing: Comply with installation requirements in Section 088000 "Glazing" and with manufacturer's written instructions.
- I. Line astragals with lead sheet.
- J. Hardware: Line covers, escutcheons, and plates to provide effective shielding at cutouts and penetrations of frames and doors. See Section 087100 "Door Hardware" for other installation requirements.

3.8 INSTALLATION OF LEAD-LINED MODULAR SHIELDING PARTITIONS

- A. Install partitions after finishes are complete in spaces where partitions are located. Install in accordance with manufacturer's written instructions and approved Shop Drawings.
- B. Cut and remove wall base where modular shielding partitions meet other walls, so partition fits tightly to wall.
- C. Secure partition framing to floor with **1/4-inch (6.35-mm)** expansion anchors **16 inches (400 mm)** o.c., and fasten to walls and ceilings as indicated. Brace partitions with tie rods fastened to walls or ceilings as indicated.

3.9 INSTALLATION OF PENETRATING ITEMS

- A. At penetrations of lead linings, provide lead shields to maintain continuity of protection.
- B. Provide lead linings, sleeves, shields, and other protection in thickness of not less than that required in assembly being penetrated.
- C. Secure shields at penetrations using adhesive or wire ties but not penetrating fasteners unless indicated on Drawings.
- D. Outlet Boxes and Conduit: Cover or line with lead sheet lapped over adjacent lead lining at least **1 inch (25 mm)**. Wrap conduit with lead sheet for a distance of not less than **10 inches (250 mm)** from box.
- E. Duct Openings: Unless otherwise indicated, line or wrap ducts with lead sheet for distance from partition/ceiling equal to 3 times the largest opening dimension. Lap lead sheet with adjacent lead lining at least **1 inch (25 mm)**.
- F. Piping: Unless otherwise indicated, wrap piping with lead sheet for a distance of not less than **10 inches (250 mm)** from point of penetration.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections after radiology equipment has been installed and placed in operating condition.
- B. Correct deficiencies in or remove and replace radiation protection that inspection reports indicate does not comply with specified requirements.

3.11 PROTECTION

- A. Lock radiation-protected rooms once doors and locks are installed, and limit access to only those persons performing work in the rooms.

END OF SECTION 13 49 00 00



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Task	Specification	Specification Description
13 49 13 00	13 49 00 00	Radiation Protection
13 49 16 00	13 49 00 00	Radiation Protection
13 49 19 00	13 49 00 00	Radiation Protection
13 49 19 16	13 49 00 00	Radiation Protection



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SECTION 14 01 30 71 - ESCALATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Escalators.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 2. Section 051200 "Structural Steel Framing" for attachment plates, angle brackets, and other structural-steel preparations for supporting escalator trusses.
 - 3. Section 083113 "Access Doors and Frames" for wall and ceiling access panels and access doors in escalator enclosures.
 - 4. Section 101423 "Panel Signage" for "Caution" signs required by ASME A17.1/CSA B44.
 - 5. **[Section 284600 "Fire Detection and Alarm"]****[and]****[Section 284614 "Single- and Multiple-Station Alarms"]** for smoke detectors that activate escalator alarm and, after at least 15 seconds, cause the interruption of power to the escalator motor and brake and for connection of alarm system to escalator controllers.

1.2 DEFINITIONS

- A. High-Traffic Escalators: Escalators designed specifically for high-traffic-volume use that produces dense occupancy, resulting in structural, machinery, and brake loads much higher than normal.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include capacities, sizes, performances, safety features, finishes, and similar information.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details indicating coordination with building structure and relationships with other construction.
 - 2. Indicate maximum loads imposed on building structure at points of support and power requirements.
 - 3. Indicate access and ventilation for escalator machine space.
- C. Samples for Initial Selection: For exposed materials involving color selection.
- D. Samples for Verification: For exposed escalator finishes, **3-inch- (75-mm-)** square Samples of sheet materials and **4-inch (100-mm)** lengths of running trim members.
- E. Delegated Design Submittals: For escalators.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For escalator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by manufacturer, certifying that escalator layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for escalator system being provided.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For escalators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted escalator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal, from Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Escalator manufacturer **[or an authorized representative who is trained and approved by manufacturer]**.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, escalator equipment with integral anchors, and other items that are embedded in concrete or masonry for escalator equipment. Furnish templates, sleeves, escalator equipment with integral anchors, and installation instructions; deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to escalators, including sumps and floor drains in pits; electrical outlets, lights, and switches in pits; and electrical service.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace escalator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design escalators.
- C. Drive System Energy Performance: Provide regenerative drive system and motor that complies with requirements of the International Green Construction Code (IgCC).
- D. Step/Skirt Performance Index: Not more than 0.15.
- E. Seismic Performance: Escalators shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7]**<Insert requirement>**.
 - 1. Design earthquake spectral response acceleration short period (Sds) for Project is **<Insert value>**.
 - 2. Project's Seismic Design Category: [A][B][C][D][E][F].
 - 3. Escalator Component Importance Factor: 1.0.
- F. Structural and Mechanical Performance for High-Traffic Escalators: For the purposes of structural design and driving machine, power transmission, and brake calculations, design high-traffic escalators for loads of not less than [two]**<Insert number>** times the design loads required by ASME A17.1/CSA B44.
- G. Structural Performance of Balustrades, Deck Barricades, and Handrails: Provide components and assemblies capable of withstanding the effects of loads indicated in ASCE/SEI 7 for handrail assemblies and guardrail systems.

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2.2 ESCALATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Fujitec America, Inc]**
 2. **[KONE Inc]**
 3. **[Mitsubishi Electric US, Inc.]**
 4. **[Otis Worldwide Corporation]**
 5. **[Schindler Elevator Corp]**
 6. **[ThyssenKrupp Elevator]**
 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Fujitec America, Inc]**
 2. **[KONE Inc]**
 3. **[Mitsubishi Electric US, Inc.]**
 4. **[Otis Worldwide Corporation]**
 5. **[Schindler Elevator Corp]**
 6. **[ThyssenKrupp Elevator]**
 7. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain escalators **[and elevators][and moving walks]**, **elevators, and moving walks** from single manufacturer.
- D. Escalators, General: Manufacturer's standard escalators complying with requirements. Unless otherwise indicated, manufacturer's standard components shall be used as included in standard escalator systems and as required for complete system.
- E. High-Traffic Escalators, General: Manufacturer's high-traffic escalators complying with requirements. Unless otherwise indicated, manufacturer's heavy-duty components shall be used as included in standard high-traffic escalator systems and as required for complete system.
- F. Design and equip escalators to run in either direction.
- G. Provide escalators with **[two][three][four]** flat steps at top and bottom landings.
- H. Rated Speed: **[90 fpm (0.46 m/s)][or][100 fpm (0.5 m/s)]**.

2.3 MATERIALS

- A. Stainless Steel: ASTM A240/A240M, **[Type 304][Type 316][Type 304, except use Type 316 for exterior escalators]**.
1. Satin Finish: No. 4 directional satin.
 2. Polished Finish: No. 8 mirror polish.
 3. Gold-Colored Satin Finish: No. 4 directional satin with gold-colored oxide or titanium nitride finish.
 4. Gold-Colored Mirror Finish: No. 8 mirror polish with gold-colored oxide or titanium nitride finish.
- B. Satin Bronze Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal), fine satin finish, lacquered.

- C. Satin Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (architectural bronze), fine satin finish, lacquered.
- D. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- E. Clear Tempered Glass: ASTM C1048, Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing, select), Kind FT (fully tempered), [10.0][12.0] mm thick.
- F. Tinted Tempered Glass: ASTM C1048, Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 2 (tinted), Quality q3 (glazing, select), Kind FT (fully tempered), [10.0][12.0] mm thick.
 - 1. Color: [Bronze][Gray][Green]<Insert color>.

2.4 COMPONENTS

- A. Fabricate exposed metalwork, including deck covers, balustrade panels, and trim, to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use; increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as necessary. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- B. Opaque Balustrades: Manufacturer's standard profile or arrangement of moving handrails on fully paneled guide rail, with interior balustrade panels, deck covers, skirts, trim, and accessories. [**Prepare for exterior finish (specified in another Section) below the deck covers.**]
- C. Transparent Balustrades: Manufacturer's standard profile or arrangement of moving handrails on guide rail that is supported by tempered glass panels, with deck covers, skirts, trim, and accessories. [**Prepare for exterior finish (specified in another Section) below the deck covers.**]
- D. Direction Indicator Lights: Provide red and green indicator lights at least **2 inches (50 mm)** in diameter in [right-hand][both] balustrade newels at both upper and lower landings. Green light indicates entrance end, and red light indicates exit end. When escalator is stopped, red lights are illuminated at both ends.
- E. Guards at Ceiling Intersection: Clear plastic.
- F. Handrails: Smooth, jointless, reinforced neoprene.
 - 1. Color: [Black][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- G. Deck Covers and Trim: [Satin stainless steel][Polished stainless steel][Gold-colored, satin stainless steel][Gold-colored, polished stainless steel][Satin bronze].
- H. Antislip Devices: [Satin stainless steel][Polished stainless steel][Gold-colored, satin stainless steel][Gold-colored, polished stainless steel][Satin bronze].
- I. Balustrade Interior Panels: [Satin stainless steel][Polished stainless steel][Gold-colored, satin stainless steel][Gold-colored, polished stainless steel][Satin bronze].
- J. Balustrade Exterior Panels and Escalator Soffits: [Satin stainless steel][Polished stainless steel][Gold-colored, satin stainless steel][Gold-colored, polished stainless steel][Satin bronze].

- K. Skirt Panels, if Applicable: **[Satin stainless steel][Polished stainless steel][Satin stainless steel with exposed surface coated with clear PTFE][Steel panels with exposed surface coated with PTFE][Manufacturer's standard low-friction material]**.
- L. Skirt Deflector Devices: Manufacturer's standard brush-type device.
- M. Steps: One piece made of die-cast aluminum with demarcation grooves at front and rear of tread surface.
 - 1. Finish: Powder-coated **[gray][black]<Insert color>**.
 - 2. Step Demarcation: Yellow stripe at sides and backs of step treads.
 - 3. Nosing Demarcation: **2-inch- (50-mm-)** wide yellow stripe at nosings of step treads.
- N. Combs: **[Integrally colored structural plastic][Cast aluminum][Cast aluminum with powder-coated finish]**.
 - 1. Comb Color: **[Yellow][Black][Gray][Red]<Insert color>**.
- O. Combplate Lights: Provide recessed light fixtures with flush lenses mounted in skirt panels at each side of combplates to illuminate combplate steps.
- P. Floor Plates: **[Cast or extruded aluminum][Stainless steel]** with grooved or patterned surface **[and with abrasive material embedded in or metallically bonded to floor-plate surface]**.

2.5 FEATURES

- A. Operational Control: Provide key-operated starter switches **[and key-operated switches for directional control]** located on exterior deck above newel base at both upper and lower landings of escalators.
- B. Fault Indicator: Provide escalators with a microprocessor unit that monitors safety devices, motor temperature, and escalator speed and records in nonvolatile memory the date, time, and device identification if a safety device is activated or escalator malfunctions.
 - 1. Provide built-in **[or plug-in]** unit to display recorded information.
- C. Reduced-Current Starting: Provide escalator motors with wye-delta or solid-state starting.
- D. Energy-Saving Feature: Provide escalator motors and controls designed for motors running on partial windings (at reduced power) when not under full load.
- E. Standby Speed Feature: Provide variable-speed controls that comply with ASME A17.1/CSA B44 and the following:
 - 1. Controls decelerate the escalator to a speed of no more than **20 fpm (0.10 m/s)** after the escalator is unoccupied and no passengers are approaching escalator for a predetermined time interval.
 - 2. Controls detect approaching passengers and accelerate the escalator to rated speed by the time passengers reach the combplate.
- F. Provide motors complying with NEMA MG 1, Insulation Class B.
- G. Brake-Saving Feature: Provide stopping mechanism that allows escalator to coast to a stop before

applying brakes unless stopping is initiated by a safety device.

- H. Equip step drive mechanism with automatic step-chain lubricators.
- I. Oil Drip Pan: Provide metal pan under full width and length of escalator to collect and hold oil and grease drippings from lubricated components. Design and fabricate drip pan to sustain a load of **250 lbf (1.1 kN)** on a **1.0-sq. ft. (0.9-sq. m)** area at any location without permanent deflection.
- J. Upper-Landing, Step Upthrust Device: Activated if a step is displaced against upthrust track at upper curve in passenger-carrying line of track system.
- K. Comb-Step Impact Device:
 - 1. Activated if a horizontal force in direction of travel is applied exceeding **400 lbf (1780 N)** at either side or **800 lbf (3560 N)** at center of front edge of combplate, or a resultant force in upward direction is applied exceeding **150 lbf (670 N)** at center of front edge of combplate.
 - 2. Activated if a horizontal force in direction of travel is applied exceeding **112 lbf (500 N)** at either side or **225 lbf (1000 N)** at center of front edge of combplate, or a resultant force in upward direction is applied exceeding **150 lbf (670 N)** at center of front edge of combplate.

2.6 EXTERIOR ESCALATORS

- A. Fabricate exposed components from **[stainless steel][bronze]** unless otherwise indicated.
- B. Hot-dip galvanize escalator trusses and other structural components to comply with ASTM A123/A123M. Use only stainless-steel or zinc-plated fasteners.
- C. Fabricate oil drip pan from galvanized-steel sheet. Provide drain and oil/water separator in oil drip pan.
- D. Provide drains, weeps, and drips to prevent water accumulation on horizontal surfaces and to direct water away from electrical equipment and moving parts.
- E. Provide enclosures complying with NEMA 250, Type 4 for electrical connections, switches, and equipment.
- F. Provide totally enclosed motors complying with NEMA MG 1, Insulation Class B.
- G. Equip step drive mechanism with automatic step-chain lubricators.
- H. Provide electric heaters with integral thermostats in escalator truss space to maintain temperature above **40 deg F (4.4 deg C)**.
- I. Equip combplates with 400-W electric heaters to prevent ice and snow accumulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine escalator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine supporting structure, machine spaces, and pits; verify critical dimensions; and examine

conditions under which escalators are to be installed.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ESCALATORS

- A. Comply with manufacturer's written instructions.
- B. Set escalators true to line and level, properly support, and anchor to building structure. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.
- C. Adjust installed components for smooth, efficient operation, complying with required tolerances and ensuring they are free of hazardous conditions. Lubricate operating parts, including bearings, tracks, chains, guides, and hardware. Test operating devices, equipment, signals, controls, and safety devices. [**Install oil drip pans and verify that no oil drips outside of pans.**]
- D. Repair damaged finishes so no evidence remains of correction work. Return items to the shop that cannot be refinished in the field, make required repairs, and refinish entire unit, or provide new units as required.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of escalator installation and before permitting escalator use, perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by authorities having jurisdiction.
 - 1. For escalators specified to comply with requirements more stringent than those of ASME A17.1/CSA B44, perform tests for compliance with specified requirements. Test safety devices that are not required by ASME A17.1/CSA B44 as well as those that are.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **<Insert number>** months' full maintenance by skilled employees of escalator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper escalator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours, with response time of **[two]<Insert number>** hours or less.
 - 3. Include 24-hour-per-day, seven-day-per-week emergency callback service, with response time of **[two]<Insert number>** hours or less.



3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] escalators.
- B. Check operation of escalators with Owner's personnel present before date of Substantial Completion[**and not more than one month before end of warranty period**]. Determine that operation systems and devices are functioning properly.

END OF SECTION 14 01 30 71



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14 - Conveying Equipment

Task	Specification	Specification Description
14 01 30 71	14 21 00 00	Electric Traction Elevators
14 01 30 71	14 24 00 00	Hydraulic Elevators

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SECTION 14 21 00 00 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Electric traction elevators.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 - 3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 4. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 - 5. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - 6. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
 - 7. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
 - 8. Section 057000 "Decorative Metal" for combination hall push-button stations.
 - 9. Section <Insert Section number> "<Insert Section title>" for finish flooring in elevator cars.
 - 10. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
 - 11. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
 - 12. Section 142113 "Electric Traction Freight Elevators" for electric traction elevators used primarily for carrying freight and inaccessible to the general public.
 - 13. Section 142123.16 "Machine Room-Less Electric Traction Passenger Elevators."
 - 14. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
 - 15. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling for telephone service for elevators[and for connection to elevator controllers for remote monitoring of elevator performance].
 - 16. [Section 284600 "Fire Detection and Alarm"] [and] [Section 284614 "Single- and Multiple-Station Alarms"] for smoke detectors in elevator lobbies to initiate emergency recall operation[, for heat detectors in shafts and machine rooms to disconnect power from elevator equipment on or before sprinkler activation,] and for connection to elevator controllers.

1.2 ALLOWANCES

- A. Elevator Car Allowances: Provide finished passenger[**and service**] elevator cars under the Elevator Car Allowance specified in Section 012100 "Allowances." Allowance includes the following:
1. Car wall finishes including trim.
 2. Car floor finishes.
 3. Car ceiling finishes.
 4. Car door finishes.
 5. Hoistway door[**and frame**] finishes.
 6. Car light fixtures.
 7. Handrails.
 8. Cutouts and other provisions for installing elevator signal equipment in cars.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
 2. Include large-scale layout of car-control station[**and standby power operation control panel**].
 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; **3-inch (75-mm-)** square Samples of sheet materials; and **4-inch (100-mm)** lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Data: Certificates, for elevator equipment, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of

- assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as indicated on Drawings, and electrical service[**including standby power generator**], as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
- 1. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44[, **including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal:
- 1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 - 2. Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, a "Draft of Elevator Maintenance Agreement," starting on date initial maintenance service is concluded.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

14 - Conveying Equipment



- B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain electric traction elevators[, **including freight and hydraulic elevators specified in other Sections,**] from single manufacturer.
 - 1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, to be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system to withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>** and to comply with elevator seismic requirements in ASME A17.1/CSA B44.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[**and the system will be fully operational after the seismic event**]."
 - 2. Project Seismic Design Category: **[C][D][E][F]**.
 - 3. Elevator Component Importance Factor: **[1.5][1.0]**.
 - 4. Design earthquake spectral response acceleration short period (Sds) for Project is **<Insert value>**.
 - 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
 - 6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELECTRIC TRACTION ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Fujitec America, Inc]
2. [KONE Inc]
3. [MEI]
4. [Mitsubishi Electric US, Inc.]
5. [Otis Worldwide Corporation]
6. [Schindler Elevator Corp]
7. [Schumacher Elevator Co]
8. [ThyssenKrupp Elevator]
9. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Fujitec America, Inc]
2. [KONE Inc]
3. [MEI]
4. [Mitsubishi Electric US, Inc.]
5. [Otis Worldwide Corporation]
6. [Schindler Elevator Corp]
7. [Schumacher Elevator Co]
8. [ThyssenKrupp Elevator]
9. <Insert manufacturer's name>

- C. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components to be used, as included in standard elevator systems and as required for complete system.

- D. Elevator Description: .

1. Group Number: <Insert a different number for each group of elevators that share a group operation system>.
2. Elevator Number(s): <Insert elevator number(s) as indicated on Drawings>.
3. Emergency Elevator Number(s): <Insert elevator number(s) as indicated on Drawings>.
4. Service Elevator Number(s): <Insert elevator number(s) as indicated on Drawings>.
5. Machine Type: [Geared][Gearless] traction.
6. Rated Load: [2000 lb (908 kg)][2100 lb (953 kg)][2500 lb (1135 kg)][3000 lb (1362 kg)][3500 lb (1589 kg)][4000 lb (1816 kg)][4500 lb (2043 kg)][5000 lb (2270 kg)]<Insert value>.
7. Freight Loading Class for Service Elevator(s): Class A.
8. Rated Speed: [200 fpm (1.0 m/s)][350 fpm (1.8 m/s)][400 fpm (2.0 m/s)][450 fpm (2.3 m/s)][500 fpm (2.5 m/s)][700 fpm (3.6 m/s)][800 fpm (4.1 m/s)][1000 fpm (5.1 m/s)][1200 fpm (6.1 m/s)][1400 fpm (7.1 m/s)]<Insert value>.
9. Operation System: [Selective-collective automatic operation][Group automatic operation][Group automatic operation with demand-based dispatching][Destination-based group automatic operation].
10. Auxiliary Operations:
 - a. Standby power operation.
 - b. Standby-powered lowering.
 - c. Battery-powered automatic evacuation.
 - d. Automatic dispatching of loaded car.
 - e. Nuisance-call cancel.
 - f. Loaded-car bypass.
 - g. Distributed parking.

- h. Off-peak operation.
 - i. Automatic operation of lights and ventilation fans.
 - j. **[Emergency hospital][Priority]** service at **[all]<Insert floor designations>** floors.
 - k. Independent service for **[service elevator][one car in group][all cars in group]**.
11. Security Features: **[Card-reader operation][Keyswitch operation][Keypad operation][Car-to-lobby feature]**.
12. Dual Car-Control Stations: Provide two car-control stations **[in each elevator]**; equip only one with required keyswitches if any.
13. Car Enclosures:
- a. Inside Width: **[Not less than][64 inches (1626 mm)][66 inches (1676 mm)][68 inches (1727 mm)][70 inches (1778 mm)][80 inches (2032 mm)][89-1/2 inches (2273 mm)][92 inches (2337 mm)]<Insert dimension>** from side wall to side wall.
 - b. Inside Depth: **[Not less than][51 inches (1295 mm)][53 inches (1346 mm)][56-1/2 inches (1435 mm)][60 inches (1524 mm)][64-1/2 inches (1638 mm)][66 inches (1676 mm)][68 inches (1727 mm)][88 inches (2235 mm)][89 inches (2261 mm)][90-1/2 inches (2298 mm)][93-1/2 inches (2375 mm)][95 inches (2413)][96-1/2 inches (2451 mm)][101 inches (2565 mm)][102 inches (2591 mm)][104 inches (2641 mm)][108 inches (2743 mm)]<Insert dimension>** from back wall to front wall (return panels).
 - c. Inside Height: Not less than **[93 inches (2362 mm)]<Insert dimension>** to underside of ceiling.
 - d. Front Walls (Return Panels): **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered]**.
 - e. Car Fixtures: **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered]**.
 - f. Side and Rear Wall Panels: **[Enameled or powder-coated steel][Plastic laminate][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Satin bronze, lacquered]**.
 - g. Reveals: **[Black][Enameled or powder-coated steel][Anodized aluminum][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered]**.
 - h. Door Faces (Interior): **[Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate]**.
 - i. Door Sills: **[Aluminum][Bronze][Nickel silver]**.
 - j. Ceiling: **[Luminous ceiling][Enameled or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Reflective metallic-finish, plastic-laminate, stainless steel][Reflective metallic-finish, plastic-laminate, bronze]**.
 - k. Handrails: **[1-1/2 inches (38 mm) round][1/2 by 2 inches (13 by 50 mm) rectangular]<Insert dimension>****[anodized aluminum][mirror-polished stainless steel][satin stainless steel][mirror-polished bronze, lacquered][satin bronze, lacquered]**, at **[sides][and][rear]** of car.
 - l. Floor: Manufacturer's standard carpet.
 - m. Floor prepared to receive carpet (specified in Section 096816 "Sheet Carpeting").
 - n. Floor prepared to receive resilient flooring (specified in Section 096516 "Resilient Sheet Flooring").
 - o. Floor recessed and prepared to receive **[dimension stone tile (specified in Section 093033 "Stone Tiling")][ceramic tile (specified in Section 093013 "Ceramic Tiling")]**.
 - p. Floor Thickness, Including Setting Materials: **<Insert thickness>** above plywood subfloor.

14. Hoistway Entrances:

- a. Width: [36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)][54 inches (1372 mm)]<Insert dimension>.
- b. Height: [84 inches (2134 mm)]<Insert dimension>.
- c. Type: [Single-speed side sliding][Two-speed side sliding][Single-speed center opening][Two-speed center opening].
- d. Frames: [At first floor.][At basement floor.][Enameled or powder-coated steel][Primed or powder-coated steel][Primed or powder-coated steel to receive stone][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Steel subframes to receive stone].
- e. Frames at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
- f. Doors and Transoms: [At first floor.][At basement floor.][Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
- g. Doors and Transoms at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
- h. Sills: [At first floor.][At basement floor.][Aluminum][Bronze][Nickel silver].
- i. Sills at Other Floors: [Aluminum][Bronze][Nickel silver].

15. Hall Fixtures: [At first floor.][At basement floor.][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].

16. Hall Fixtures at Other Floors: [Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].

17. Additional Requirements:

- a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from [polished stainless steel, ASTM A480/A480M, No. 8 finish][satin stainless steel, ASTM A480/A480M, No. 4 finish][polished bronze, lacquered][satin bronze, lacquered].
- b. Provide hooks for protective pads in [service car][all cars] and [one][two]<Insert number> complete set(s) of full-height protective pads.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines[or variable-voltage dc-type hoisting machines] and solid-state power converters.

1. Provide [regenerative][or][nonregenerative] system.
2. Provide regenerative system that complies with the IgCC.
3. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building

power system.

- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: **[Roller guides][or][polymer-coated, nonlubricated sliding guides]**. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Group Automatic Operation with Demand-Based Dispatching: Provide **[reprogrammable]** group automatic system that assigns cars to hall calls based on a dispatching program designed to minimize passenger **[wait time][time to destination]**. System automatically adjusts to demand changes for different traffic conditions including heavy incoming, heavy two-way, heavy outgoing, and light off-hours as variations of normal two-way traffic.
- C. Destination-Based Group Automatic Operation: Provide reprogrammable group automatic system that assigns elevators leaving the main lobby in the up direction to a selected group of floors and directs passengers to an elevator serving their destination floor. System dispatches cars in a regulated sequence for optimum system efficiency; dispatch is based on origin and destination of calls. System automatically adjusts to changes in demand for different traffic conditions including heavy incoming, heavy two-way, heavy outgoing, and light off-hours as variations of normal two-way traffic.
- D. Auxiliary Operations:
 - 1. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at **[main lobby][fire-command station]<Insert location>**. Manual operation causes automatic operation to cease.
 - 2. Single-Car Standby-Powered Lowering: On activation of standby power, if car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to the next floor below, opens its doors, and shuts down.
 - 3. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
 - 4. Group Standby Power Operation:
 - a. On activation of standby power, cars are returned to a designated floor and parked with doors open. One car is returned at a time, with priority given to loaded cars. If a car cannot be returned after two attempts, it is removed from the system. When all cars have been returned or removed from the system, one car is automatically placed in service. If car

selected for service cannot operate within 60 seconds, the system removes car from service and places another car in service. Cars can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at **[main lobby][fire-command station]<Insert location>**. Manual operation causes automatic operation to cease.

- b. On activation of standby power, cars are returned, one at a time, to a designated floor and parked with doors open. If a car cannot be returned, it is removed from the system. When all cars have been returned or removed from the system, one car can be put in service on standby power by a selector switch in control panel located at **[main lobby][fire-command station]<Insert location>**.
5. Group Battery-Powered Automatic Evacuation: If power fails, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are moved one at a time to the next floor above or below, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.
 6. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
 7. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls **[and predetermined weight]** can be adjusted.
 8. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
 9. Distributed Parking: When cars are not required for response to calls, they are parked with doors closed and distributed in predetermined zones throughout the building. One zone to include the main floor and adjacent floors; remaining floors to be divided into approximately equal zones.
 10. Off-Peak Operation: During periods of low traffic, half of the elevators in a group to be taken out of service and switched to low power mode.
 11. Independent Service: Keyswitch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.
 12. Priority Service: Service is initiated by a **[keyswitch][card reader][remote switch]** at designated floors. One elevator is removed from group operation and directed to the floor where service was initiated. On arriving at the floor, elevator opens its doors and parks **[and a lighted sign directs passengers to exit elevator]**. Car is placed in operation by selecting a floor and pressing door close button or by operating keyswitch to put car in independent service. After responding to floor selected or being removed from independent service, car is returned to group operation. If car is not placed in operation within a preset time after being called, it is returned to group operation.
 13. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.
- E. Security features are not to not affect emergency firefighters' service.
1. Card-Reader Operation: System uses card readers at **[car-control stations][and][hall push-button stations]** to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. **[Allow space for card reader in car][Provide stripe-swipe card reader integral with each car-control station]**.
 - a. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**
 2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at **[car-control stations][and][hall push-button stations]**. Key is removable **[only in deactivated][in**

- either]** position.
3. Keypad Operation: Allows each landing to be restricted or unrestricted. When a restricted landing button is pressed, a "Restricted Floor" lamp lights and remains lit until landing access code has been entered into a keypad or predetermined time has elapsed. Car calls for restricted landings do not register until landing access code is entered into keypad within predetermined time after landing button is pressed.
 - a. Access codes are programmed at each car operating panel using a security keyswitch. Keypad operation can be activated and deactivated by security keyswitch at main landing.
 4. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes **[car][all cars in a group]** to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. Provide **[enameled or powder-coated steel car enclosures to receive removable][steel-framed car enclosures with nonremovable]** wall panels, with **[removable]** car roof, access doors, power door operators, and ventilation.
 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
 2. See "Allowances" Paragraph in "Summary" Article for items to be provided under the Elevator Car Allowance. Provide items not included in the Elevator Car Allowance as needed for finished car **[including materials and finishes specified below]**.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 1. Subfloor:
 - a. Exterior, underlayment grade plywood, not less than **5/8-inch (15.9-mm)** nominal thickness.
 - b. Exterior, C-C Plugged grade plywood, not less than **7/8-inch (22.2-mm)** nominal thickness.
 2. Floor Finish:
 - a. Specified in Section **<Insert Section number> "<Insert Section title>."**
 - b. Elevator manufacturer's standard level-loop nylon carpet; color as selected by Architect from full range of industry colors.
 3. Enameled or Powder-Coated Steel Wall Panels: Flush, formed-metal construction; fabricated

- from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
4. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
 5. Bronze Wall Panels: Flush, formed-metal construction; fabricated from bronze sheet.
 6. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to **[1/2-inch (13-mm) fire-retardant-treated particleboard][manufacturer's standard honeycomb core][manufacturer's standard formed metal panels]** with **[plastic-laminate panel backing and]** manufacturer's standard protective edge trim. Panels to have a flame-spread index of **[25][75]** or less, when tested according to ASTM E84. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 7. Fabricate car with recesses and cutouts for signal equipment.
 8. Fabricate car door frame integrally with front wall of car.
 9. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 10. Primed or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied, rust-resistant primer or powder-coating for field painting.
 11. Stainless Steel Doors: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning]**.
 12. Bronze Doors: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 13. Plastic-Laminate Doors: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled or powder-coated steel doors and covering edges with protective edge trim **[matching return panels]**. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 14. Unfinished-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder-coating.
 15. Sight Guards: Provide sight guards on car doors.
 16. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.
 17. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
 18. Ceiling: **[Metal][Metallic-finish, plastic-laminate]** flush panels, with **[incandescent downlights in the center of][four low-voltage downlights in]** each panel. **[Align ceiling panel joints with joints between wall panels.]**
 19. Light Fixture Efficiency: Not less than 35 lumens/W.
 20. Ventilation Fan Efficiency: Not less than **3.0 cfm/W (1.4 L/s per W)**.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.
 1. Where gypsum board wall construction is indicated, frames to be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies to comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, based on testing at as close-to-neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
 1. Fire-Protection Rating: **[1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise**

of 450 deg F (250 deg C)].

- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 2. Primed or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder-coating for field painting.
 3. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
 4. Stainless Steel Frames: Formed from stainless steel sheet.
 5. Bronze Frames: Formed from cold- or hot-rolled steel sheet, with enamel or powder-coat finish, and with formed-bronze sheet laminated to steel frames using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 6. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than **3 inches (76 mm)** high, on both jambs of hoistway door frames.
 7. Enameled or Powder-Coated Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 8. Primed or Powder-Coated Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder-coating for field painting.
 9. Stainless Steel Doors and Transoms: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning]**.
 10. Bronze Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 11. Plastic-Laminate Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled or powder-coated steel doors and covering edges with protective edge trim **[matching door frames]**. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 12. Unfinished-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder-coating.
 13. Sight Guards: Provide sight guards on doors matching door edges.
 14. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.
 15. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

- A. Provide **[hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled][signal equipment designed for destination-based system]**. Provide **[vandal-resistant]** buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard **[recessed][or][semirecessed]** car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

- C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
 - 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Firefighters' Two-Way Telephone Communication Service: Provide **[flush-mounted cabinet][telephone jack]** in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**
- F. Car Position Indicator: Provide **[illuminated,]**digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- G. Hall Push-Button Stations: **[Provide one hall push-button station at each landing][Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group][Provide hall push-button stations at each landing as indicated].**
 - 1. Provide **[manufacturer's standard wall-mounted units][units with flat faceplate for mounting with body of unit recessed in wall].**
 - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 - 3. Equip units with **[buttons][or][touch screen]** for calling elevator and for indicating direction of travel or destination as required by system. Provide a signaling system to verify floor selection, where destination registration is required, and to direct passengers to appropriate car.
 - a. Provide a means for passengers to indicate that they have disabilities so control system can allow extra room in assigned car.
 - b. Provide for connecting units that require destination registration to building security access system so a card reader can be used to register calls.
 - 4. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**
- H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide **[one of]** the following:
 - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
 - 2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
 - 3. Units mounted in both jambs of entrance frame **[for each elevator].**
 - 4. Units mounted in both car door jambs; **may be used only for single elevators or for two-car groups].**

14 - Conveying Equipment

- I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 - 1. At manufacturer's option, audible signals may be placed on cars.
- J. Hall Position Indicators: Provide **[illuminated,]**digital-display-type position indicators, located above**[each]** hoistway entrance at ground floor. Provide units with flat faceplate and with body of unit recessed in wall.
 - 1. Integrate ground-floor hall lanterns with hall position indicators.
- K. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.**[For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.]**
- L. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.
- M. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.
- N. **<Insert requirements>.**

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- D. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304 with embossed texture rolled into exposed surface.
 - 1. Product: Subject to compliance with requirements, provide "**<Insert product name or designation>**" by **<Insert manufacturer's name>**.
 - 2. Metal surface is **[satin polished][satin relieved][titanium nitride colored][oxide colored][satin polished and titanium nitride colored][satin relieved and titanium nitride colored][satin polished and oxide colored][satin relieved and oxide colored][color coated and satin relieved][color coated and bright relieved]** after texturing.
- E. Stainless Steel Bars: ASTM A276/A276M, Type 304.
- F. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- G. Bronze Plate and Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal).

- H. Bronze Extrusions: ASTM B455/B455M, Alloy UNS No. C38500 (architectural bronze).
- I. Bronze Tubing: ASTM B135/B135M, Alloy UNS No. C23000 (red brass, 85 percent copper).
- J. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- K. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500 or UNS No. C77600.
- L. Plastic Laminate: High-pressure type complying with ISO 4586-3, **[Type HGS for flat applications][Type HGL for flat applications][Type HGP for postformed applications][and][Type BKV for panel backing]**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ELECTRIC TRACTION ELEVATORS

- A. Comply with manufacturer's written instructions.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: **1/8 inch (3 mm)**, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.

2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of **72 inches (1829 mm)** above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Operating Test: Load **[elevator][each elevator][one elevator of each type, capacity, speed, and travel distance]** to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: **[Limit temporary use for construction purposes to one elevator.]** Comply with the following requirements for **[each]** elevator used for construction purposes:
 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 2. Provide strippable protective film on entrance and car doors and frames.
 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 5. Do not load elevators beyond their rated weight capacity.
 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies to be manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.
- B. **<Insert elevator maintenance agreement>**.



3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] elevator(s).
- B. Check operation of[**each**] elevator with Owner's personnel present before date of Substantial Completion[**and again not more than one month before end of warranty period**]. Determine that operation systems and devices are functioning properly.

END OF SECTION 14 21 00 00

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SECTION 14 21 13 00 - ELECTRIC TRACTION FREIGHT ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric traction freight elevators.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
3. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for **[subsills][and][hoistway door frames]** that are part of steel frame.
4. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for **[subsills][and][hoistway door frames]**.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
5. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
6. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
7. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
8. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair conductor telephone service for elevators **[and for Internet connection to elevator controllers for remote monitoring of elevator performance]**.
9. **[Section 284621.11 "Addressable Fire-Alarm Systems"]****[Section 284621.13 "Conventional Fire-Alarm Systems"]** for smoke detectors in elevator lobbies to initiate emergency recall operation **[and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation]** and for connection to elevator controllers.

1.2 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, [**machine room layout**], coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and [**machine room**][**control closet**] layout and dimensions, as shown on Drawings, and electrical service[**including standby power generator**], as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's/installer's standard operation and maintenance manual, according to ASME A17.1[**including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard [**one-year**][**two-year**][**five-year**]**<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

- D. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to electric traction freight elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRIC TRACTION FREIGHT ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Fujitec America, Inc]**
 - 2. **[KONE Inc]**
 - 3. **[MEI]**

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4. [Mitsubishi Electric US, Inc.]
5. [Otis Worldwide Corporation]
6. [Schindler Elevator Corp]
7. [Schumacher Elevator Co]
8. [ThyssenKrupp Elevator]
9. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Fujitec America, Inc]
2. [KONE Inc]
3. [MEI]
4. [Mitsubishi Electric US, Inc.]
5. [Otis Worldwide Corporation]
6. [Schindler Elevator Corp]
7. [Schumacher Elevator Co]
8. [ThyssenKrupp Elevator]
9. <Insert manufacturer's name>

C. Source Limitations: Obtain freight elevators[, including hydraulic freight elevators specified in Section 142413 "Hydraulic Freight Elevators,"] from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement> and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.
 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[and the system will be fully operational after the seismic event]."
 2. Project Seismic Design Category: [C][D][E][F].
 3. Elevator Component Importance Factor: [1.5][1.0].
 4. Design earthquake spectral response acceleration short period (Sds) for Project is <Insert value>.
 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
 6. Provide seismic switch required by ASCE/SEI 7.

2.3 FREIGHT ELEVATORS

- A. Elevator System, General: Manufacturer's standard electric traction freight elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Elevator Number(s): **<Insert elevator number(s) as shown on Drawings>**.
2. Elevator Type: **[Geared][Gearless]** traction.
3. Machine Location: **[Machine room above hoistway][Hoistway; no machine room is provided]**.
4. Rated Load: **[2000 lb (908 kg)][2500 lb (1135 kg)][3000 lb (1362 kg)][4000 lb (1816 kg)][5000 lb (2270 kg)][6000 lb (2720 kg)][8000 lb (3632 kg)][10,000 lb (4540 kg)]<Insert value>**.
5. Freight Loading Class: **[Class A][Class B][Class C1][Class C2][Class C3]**.
6. Rated Speed: **[75 fpm (0.38 m/s)][100 fpm (0.51 m/s)][150 fpm (0.76 m/s)][200 fpm (1.0 m/s)][350 fpm (1.8 m/s)]<Insert value>**.
7. Operation System: **[Single automatic][Car-switch automatic floor stop][Selective-collective automatic]**.
8. Auxiliary Operations:
 - a. Standby power operation.
 - b. Battery-powered automatic evacuation.
 - c. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
 - d. Load-weighing device.
 - e. Automatic operation of lights and ventilation fans.
9. Security Feature: **[Card-reader][Keyswitch]** operation.
10. Auxiliary Car-Control Station: Provide additional car-control station mounted on side of car at height to facilitate operation by forklift-truck operator without leaving truck.
11. Car Enclosures:
 - a. Platform Width: **[64 inches (1626 mm)][76 inches (1930 mm)][88 inches (2235 mm)][100 inches (2540 mm)]<Insert dimension>**.
 - b. Platform Depth: **[84 inches (2134 mm)][96 inches (2438 mm)][120 inches (3048 mm)][144 inches (3658 mm)][168 inches (4267 mm)]<Insert dimension>**.
 - c. Ceiling Height: **[84 inches (2134 mm)][96 inches (2438 mm)][108 inches (2743 mm)]<Insert dimension>**.
 - d. Walls and Ceiling: **[Prime-painted or powder-coated steel][Prime-painted or powder-coated, metallic-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel]**.
 - e. Car Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
 - f. Floor: **[Rolled steel floor plate][Aluminum-alloy rolled tread plate][Rolled stainless steel floor plate]<Insert material>**.
 - g. Car Gate Type: **[Vertical biparting][Single-speed vertical lift][Two-speed vertical lift]**.
 - h. Car Gate Operation: **[Manual][Power operated]**.
 - i. Car Gate Material: **[Prime-painted or powder-coated steel][Satin stainless steel]**.
 - j. Car Sill: Steel angle.
 - k. Lighting:
 - 1) **[One][Two][Three] 48-inch (1219-mm), [suspended,][surface-mounted,] two-tube fluorescent light fixture(s) with [white reflectors][and][wire lamp guards]**.
 - 2) **[One][Two] 48-inch (1219-mm), recessed, [two][three]-tube fluorescent light fixture(s) with UV-stabilized acrylic diffusers not less than 0.125 inch (3.2 mm) thick.**
 - l. Light Fixture Efficiency: Not less than 35 lumens/W.
 - m. Ventilation Fan Efficiency: Not less than **3.0 cfm/W (1.4 L/s per W)**.
12. Hoistway Entrances:
 - a. Width: **[56 inches (1422 mm)][60 inches (1524 mm)][72 inches (1829 mm)][96 inches (2438 mm)]<Insert dimension>**.

- b. Height: [84 inches (2134 mm)][96 inches (2438 mm)]<Insert dimension>.
 - c. Door Type: [Vertical biparting][Single-speed vertical lift][Two-speed vertical lift].
 - d. Fire-Protection Rating: [1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise of 450 deg F (250 deg C)].
 - e. Door Operation: [Manual][Power operated with door reopening device].
 - f. Door Material: [Prime-painted or powder-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish].
 - g. Door Frame Material: [Prime-painted or powder-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish].
13. Hall Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
14. Auxiliary Hall Stations: Provide additional pendant-mounted, hall push-button stations[**where indicated**], mounted at height to facilitate operation by forklift-truck operator without leaving truck.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines[**or variable-voltage dc-type hoisting machines**] and solid-state power converters.
- 1. Provide [**regenerative**][or][**nonregenerative**] system.
 - 2. Provide regenerative system that complies with IgCC.
 - 3. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
 - 4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
 - 5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system from solid-state converters.
- B. Fluid for Hydraulic Buffers: If using hydraulic buffers, use only fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Welded[**or bolted**]-steel units.
- 1. Provide special heavy-duty units where indicated for power truck loading, designed to withstand impacts and wheel loadings indicated.
- F. Guides: [**Roller guides**][or][**polymer-coated, nonlubricated sliding guides**]. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power by a switch in control panel located at [main lobby][fire command station]<Insert location>.

- C. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
- D. Group Standby Power Operation: On activation of standby power, cars are returned one car at a time to a designated floor and parked with doors open. If a car cannot be returned, it is removed from the system. One car is selected for service on standby power by a switch in the control panel located at **[main lobby][fire command station]<Insert location>**.
- E. Group Battery-Powered Automatic Evacuation: If power fails, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are moved one at a time to the next floor above or below, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.
- F. Load-Weighing Device: When car load exceeds 80 percent of rated capacity, a signal lamp lights and remains lit in the car-control station; when car load exceeds rated capacity, car does not respond to car or hall calls.
- G. Security Features: Security features shall not affect emergency firefighters' service.
 - 1. Card-Reader Operation: System uses card readers at **[car-control stations][and][hall push-button stations]** to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. **[Allow space as indicated for card reader in car][Provide stripe-swipe card reader integral with each car-control station]**.
 - a. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**
 - 2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at **[car-control stations][and][hall push-button stations]**. Key is removable **[only in deactivated position][in either position]**.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with a uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES

- A. Provide car enclosures as indicated, including ventilation, lighting, finishes, access doors, thresholds, trim, and accessories. Fabricate with recesses and cutouts for signal equipment.
 - 1. Provide power door operators with linkages for hoistway door operation.
 - 2. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Fabrication: Provide manufacturer's standard, flush panel, welded construction made from metal sheet, of metal indicated, not less than **0.067 inch (1.7 mm)** and reinforced at **16-inch (406-mm)** maximum spacing.

1. Provide perforated panels for ceiling and for walls above **72 inches (1829 mm)** from car floor, unless required to be solid by ASME A17.1/CSA B44.

C. **<Insert requirements>**.

2.8 HOISTWAY ENTRANCES

- A. Unless otherwise indicated, provide hoistway entrance doors of type indicated below, with truckable sill bars and resilient safety meeting-rail gaskets.
 1. Equip for power operation by coordinated linkage with power-operated car door.
 2. Where gypsum board wall construction is indicated, provide fire-resistance-rated, hollow-metal, door-and-frame hoistway entrances. Provide self-supporting frames with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close-to-neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
- C. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
 1. Metal Door Panels: Constructed of metal sheets, flush on room side, welded and reinforced in steel framing with vertical reinforcing spaced not more than **24 inches (610 mm)** o.c. Fabricate panel faces from metal sheet, of metal indicated, not less than **0.097 inch (2.5 mm)** thick.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements of acrylic or other permanent, non-yellowing translucent plastic.
- B. Car-Control Stations: Provide manufacturer's standard car-control station. Mount adjacent to car door unless otherwise indicated.
 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 2. Mount controls at heights complying with the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Firefighters' Two-Way Telephone Communication Service: Provide **[flush-mounted cabinet][telephone jack]** in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in **[Section 284621.11 "Addressable Fire-Alarm Systems."]****[Section 284621.13 "Conventional Fire-Alarm Systems."]**
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station.
- F. Hall Push-Button Stations: Provide hall push-button station at each landing as indicated.

1. Provide single-button stations with **[position][“in-use”]** indicator.
- G. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in **[Section 284621.11 "Addressable Fire-Alarm Systems."][Section 284621.13 "Conventional Fire-Alarm Systems."]**

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, commercial steel, with **G60 (Z180)** zinc coating (galvanized) or **A60 (ZF180)** zinc-iron-alloy coating (galvannealed).
- D. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- E. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304 with embossed texture rolled into exposed surface.
 1. Product: Subject to compliance with requirements, provide "**<Insert product name>**" by **<Insert manufacturer's name>**.
- F. Stainless Steel Bars: ASTM A276, Type 304.
- G. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- H. Rolled Steel Floor Plate: ASTM A786/A786M.
- I. Rolled Stainless Steel Floor Plate: ASTM A793.
- J. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Pattern 1, Alloy 6061-T6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections

are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Operating Test: Load **[elevator][each elevator][one elevator of each type, capacity, speed, and travel distance]** to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: **[Limit temporary use for construction purposes to one elevator.]** Comply with the following requirements for **[each]** elevator used for construction purposes:
 - 1. Provide protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 2. Do not load elevators beyond their rated weight capacity.
 - 3. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide the same parts and supplies as those used in the manufacture and installation of original equipment.
 - 4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, **adjust, and maintain** elevator(s).
- B. Check operation of **[each]** elevator with Owner's personnel present and before date of Substantial Completion **[and not more than one month before end of warranty period]**. Determine that operation systems and devices are functioning properly.



3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.
- B. **<Insert elevator maintenance agreement>**.

END OF SECTION 14 21 13 00

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14 - Conveying Equipment

Task	Specification	Specification Description
14 21 13 00	14 21 00 00	Electric Traction Elevators



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SECTION 14 21 23 00 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Machine room-less electric traction elevators.

B. Related Requirements:

1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
4. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
5. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
6. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
7. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
8. Section 057000 "Decorative Metal" for combination hall push-button stations.
9. Section <Insert Section number> "<Insert Section title>" for finish flooring in elevator cars.
10. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
11. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
12. Section 142113 "Electric Traction Freight Elevators" for electric traction elevators used primarily for carrying freight and inaccessible to the general public.
13. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
14. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cable for telephone service for elevators[**and for connection to elevator controllers for remote monitoring of elevator performance**].
15. [Section 284600 "Fire Detection and Alarm"]**[and][Section 284614 "Single- and Multiple-Station Alarms"]** for smoke detectors in elevator lobbies to initiate emergency recall operation[, **for heat detectors in shafts and machine rooms to disconnect power from elevator equipment before or on sprinkler activation,**] and for connection to elevator controllers.

**Machine Room-Less Electric Traction Passenger
Elevators**

1.2 ALLOWANCES

- A. Elevator Car Allowances: Provide finished passenger[**and service**] elevator cars under the Elevator Car Allowance specified in Section 012100 "Allowances." Allowance includes the following:
1. Car wall finishes including trim.
 2. Car floor finishes.
 3. Car ceiling finishes.
 4. Car door finishes.
 5. Hoistway door[**and frame**] finishes.
 6. Car light fixtures.
 7. Handrails.
 8. Cutouts and other provisions for installing elevator signal equipment in cars.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
 2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
 2. Include large-scale layout of car-control station[**and standby power operation control panel**].
 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For each type of exposed finish involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; **3-inch (75-mm)-** square Samples of sheet materials; and **4-inch (100-mm)** lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service[**including standby power generator**], as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
1. Submit manufacturer's or Installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44[**including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal:
1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 2. Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, a "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates,

inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

- B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>** and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[**and the system will be fully operational after the seismic event**]."
 - 2. Project Seismic Design Category: **[C][D][E][F]**.
 - 3. Elevator Component Importance Factor: **[1.5][1.0]**.
 - 4. Design earthquake spectral response acceleration short period (Sds) for Project is **<Insert value>**.
 - 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
 - 6. Provide seismic switch required by ASCE/SEI 7.

2.2 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:

1. Group Number: **<Insert a different number for each group of elevators that share a group operation system>.**
2. Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>.**
3. Emergency Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>.**
4. Service Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>.**
5. Rated Load: **[2000 lb (908 kg)][2100 lb (953 kg)][2500 lb (1135 kg)][3000 lb (1362 kg)][3500 lb (1589 kg)][4000 lb (1816 kg)][4500 lb (2043 kg)][5000 lb (2270 kg)]<Insert value>.**
6. Freight Loading Class for Service Elevator(s): **Class A.**
7. Rated Speed: **[100 fpm (0.5 m/s)][150 fpm (0.75 m/s)][200 fpm (1.0 m/s)][350 fpm (1.8 m/s)][400 fpm (2.0 m/s)][450 fpm (2.3 m/s)][500 fpm (2.5 m/s)]<Insert value>.**
8. Operation System: **[Selective-collective automatic operation][Group automatic operation][Group automatic operation with demand-based dispatching].**
9. Auxiliary Operations:
 - a. Standby power operation.
 - b. Standby-powered lowering.
 - c. Battery-powered automatic evacuation.
 - d. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
 - e. Automatic dispatching of loaded car.
 - f. Nuisance-call cancel.
 - g. Loaded-car bypass.
 - h. Distributed parking.
 - i. Off-peak operation.
 - j. Automatic operation of lights and ventilation fans.
 - k. **[Emergency hospital][Priority]** service at **[all]<Insert floor designations>** floors.
 - l. Independent service for **[service elevator][one car in group][all cars in group].**
10. Security Features: **[Card-reader operation][Keyswitch operation][Keypad operation][Car-to-lobby feature].**
11. Dual Car-Control Stations: Provide two car-control stations **[in each elevator]**; equip only one with required keyswitches if any.
12. Car Enclosures:
 - a. Inside Width: Not less than **[64 inches (1626 mm)][66 inches (1676 mm)][68 inches (1727 mm)][70 inches (1778 mm)][80 inches (2032 mm)][89-1/2 inches (2273 mm)][92 inches (2337 mm)]<Insert dimension>** from side wall to side wall.
 - b. Inside Depth: Not less than **[51 inches (1295 mm)][53 inches (1346 mm)][56-1/2 inches (1435 mm)][60 inches (1524 mm)][64-1/2 inches (1638 mm)][66 inches (1676 mm)][68 inches (1727 mm)][88 inches (2235 mm)][89 inches (2261 mm)][90-1/2 inches (2298 mm)][93-1/2 inches (2375 mm)][95 inches (2413)][96-1/2 inches (2451 mm)][101 inches (2565 mm)][102 inches (2591 mm)][104 inches (2641 mm)][108 inches (2743 mm)]<Insert dimension>** from back wall to front wall (return panels).
 - c. Inside Height: Not less than **[93 inches (2362 mm)]<Insert dimension>** to underside of ceiling.
 - d. Front Walls (Return Panels): **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].**
 - e. Car Fixtures: **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].**
 - f. Side and Rear Wall Panels: **[Enameled or powder-coated steel][Plastic laminate][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Satin bronze, lacquered].**
 - g. Reveals: **[Black][Enameled or powder-coated steel][Anodized aluminum][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM**

- h. **A480/A480M, No. 4 finish**[[Polished bronze, lacquered]][Satin bronze, lacquered].
Door Faces (Interior): [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - i. Door Sills: [Aluminum][Bronze][Nickel silver].
 - j. Ceiling: [Luminous ceiling][Enameled or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Reflective metallic-finish, plastic-laminate, stainless steel][Reflective metallic-finish, plastic-laminate, bronze].
 - k. Handrails: [1-1/2 inches (38 mm) round][1/2 by 2 inches (13 by 50 mm) rectangular]<Insert dimension>[anodized aluminum][mirror-polished stainless steel][satin stainless steel][mirror-polished bronze, lacquered][satin bronze, lacquered], at [sides][and][rear] of car.
 - l. Floor: Manufacturer's standard carpet.
 - m. Floor prepared to receive carpet (specified in Section 096816 "Sheet Carpeting").
 - n. Floor prepared to receive resilient flooring (specified in Section 096516 "Resilient Sheet Flooring").
 - o. Floor recessed and prepared to receive [dimension stone tile (specified in Section 093033 "Stone Tiling")][ceramic tile (specified in Section 093013 "Ceramic Tiling")].
 - p. Floor Thickness, Including Setting Materials: <Insert thickness> above plywood subfloor.
13. Hoistway Entrances:
- a. Width: [36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)][54 inches (1372 mm)]<Insert dimension>.
 - b. Height: [84 inches (2134 mm)]<Insert dimension>.
 - c. Type: [Single-speed side sliding][Two-speed side sliding][Single-speed center opening][Two-speed center opening].
 - d. Frames: [At first floor.][At basement floor.][Enameled or powder-coated steel][Primed or powder-coated steel][Primed or powder-coated steel to receive stone][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Steel subframes to receive stone].
 - e. Frames at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
 - f. Doors and Transoms: [At first floor.][At basement floor.][Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - g. Doors and Transoms at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - h. Sills: [At first floor.][At basement floor.][Aluminum][Bronze][Nickel silver].
 - i. Sills at Other Floors: [Aluminum][Bronze][Nickel silver].
14. Hall Fixtures: [At first floor.][At basement floor.][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].

15. Hall Fixtures at Other Floors: **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].**
16. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from **[polished stainless steel, ASTM A480/A480M, No. 8 finish][satin stainless steel, ASTM A480/A480M, No. 4 finish][polished bronze, lacquered][satin bronze, lacquered].**
 - b. Provide hooks for protective pads in **[service car][all cars]** and **[one][two]<Insert number>** complete set(s) of full-height protective pads.

2.3 MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 1. **[Canton Elevator, Inc.]**
 2. **[Fujitec America, Inc]**
 3. **[KONE Inc]**
 4. **[MEI]**
 5. **[Mitsubishi Electric US, Inc.]**
 6. **[Otis Worldwide Corporation]**
 7. **[Schindler Elevator Corp]**
 8. **[ThyssenKrupp Elevator]**
 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Canton Elevator, Inc.]**
 2. **[Fujitec America, Inc]**
 3. **[KONE Inc]**
 4. **[MEI]**
 5. **[Mitsubishi Electric US, Inc.]**
 6. **[Otis Worldwide Corporation]**
 7. **[Schindler Elevator Corp]**
 8. **[ThyssenKrupp Elevator]**
 9. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain elevators[, **including freight elevators specified in other Sections,**] from single manufacturer.
 1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
 1. Provide **[regenerative][or][nonregenerative]** system.

2. Provide regenerative system that complies with the IgCC.
3. Limit total harmonic distortion of regenerated power to 5 percent in accordance with IEEE 519.
4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: **[Roller guides][or][polymer-coated, nonlubricated sliding guides]**. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Group Automatic Operation with Demand-Based Dispatching: Provide **[reprogrammable]** group automatic system that assigns cars to hall calls based on a dispatching program designed to minimize passenger **[wait time][time to destination]**. System automatically adjusts to demand changes for different traffic conditions including heavy incoming, heavy two-way, heavy outgoing, and light off-hours as variations of normal two-way traffic.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Fujitec America, Inc]**
 - b. **[KONE Inc]**
 - c. **[Mitsubishi Electric US, Inc.]**
 - d. **[Otis Worldwide Corporation]**
 - e. **[Schindler Elevator Corp]**
 - f. **[ThyssenKrupp Elevator]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Fujitec America, Inc]**
 - b. **[KONE Inc]**
 - c. **[Mitsubishi Electric US, Inc.]**

- d. [Otis Worldwide Corporation]
- e. [Schindler Elevator Corp]
- f. [ThyssenKrupp Elevator]
- g. <Insert manufacturer's name>

C. Auxiliary Operations:

1. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at [main lobby][fire-command station]<Insert location>. Manual operation causes automatic operation to cease.
2. Single-Car Standby-Powered Lowering: On activation of standby power, if car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to the next floor below, opens its doors, and shuts down.
3. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
4. Group Standby Power Operation:
 - a. On activation of standby power, cars are returned to a designated floor and parked with doors open. One car is returned at a time, with priority given to loaded cars. If a car cannot be returned after two attempts, it is removed from the system. When all cars have been returned or removed from the system, one car is automatically placed in service. If car selected for service cannot operate within 60 seconds, the system removes car from service and places another car in service. Cars can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at [main lobby][fire-command station]<Insert location>. Manual operation causes automatic operation to cease.
 - b. On activation of standby power, cars are returned, one at a time, to a designated floor and parked with doors open. If a car cannot be returned, it is removed from the system. When all cars have been returned or removed from the system, one car can be put in service on standby power by a selector switch in control panel located at [main lobby][fire-command station]<Insert location>.
5. Group Battery-Powered Automatic Evacuation: If power fails, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are moved one at a time to the next floor above or below, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.
6. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
7. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls[and predetermined weight] can be adjusted.
8. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
9. Distributed Parking: When cars are not required for response to calls, they are parked with doors closed and distributed in predetermined zones throughout the building. One zone to include the main floor and adjacent floors; remaining floors to be divided into approximately equal zones.
10. Off-Peak Operation: During periods of low traffic, half of the elevators in a group to be taken out of service and switched to sleep, low power mode.
11. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.

12. Independent Service: Keyswitch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.
13. Priority Service: Service is initiated by a **[keyswitch][card reader][remote switch]** at designated floors. One elevator is removed from group operation and directed to the floor where service was initiated. On arriving at the floor, elevator opens its doors and parks **[and a lighted sign directs passengers to exit elevator]**. Car is placed in operation by selecting a floor and pressing door close button or by operating keyswitch to put car in independent service. After responding to floor selected or being removed from independent service, car is returned to group operation. If car is not placed in operation within a preset time after being called, it is returned to group operation.

D. Security features may not affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at **[car-control stations][and][hall push-button stations]** to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. **[Allow space for card reader in car][Provide stripe-swipe card reader integral with each car-control station]**.
 - a. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**
2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at **[car-control stations][and][hall push-button stations]**. Key is removable **[only in deactivated][in either]** position.
3. Keypad Operation: Allows each landing to be restricted or unrestricted. When a restricted landing button is pressed, a "Restricted Floor" lamp lights and remains lit until landing access code has been entered into a keypad or predetermined time has elapsed. Car calls for restricted landings do not register until landing access code is entered into keypad within predetermined time after landing button is pressed.
 - a. Access codes are programmed at each car operating panel using a security keyswitch. Keypad operation can be activated and deactivated by security keyswitch at main landing.
4. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes **[car][all cars in a group]** to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begins to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. Provide **[enameled or powder-coated steel car enclosures to receive removable][steel-framed car enclosures with nonremovable]** wall panels, with **[removable]** car roof, access doors, power door operators, and ventilation.
1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
 2. See "Elevator Car Allowances" Paragraph in "Allowances" Article for items to be provided under the Elevator Car Allowance. Provide items not included in the Elevator Car Allowance as needed for finished car including materials and finishes specified below.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
1. Subfloor:
 - a. Exterior, underlayment grade plywood, not less than **5/8-inch (15.9-mm)** nominal thickness.
 - b. Exterior, C-C Plugged grade plywood, not less than **7/8-inch (22.2-mm)** nominal thickness.
 2. Floor Finish:
 - a. Specified in Section **<Insert Section number> "<Insert Section title>"**.
 - b. Elevator manufacturer's standard level-loop nylon carpet; color as selected by Architect from full range of industry colors.
 3. Enameled or Powder-Coated Steel Wall Panels: Flush, formed-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 4. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
 5. Bronze Wall Panels: Flush, formed-metal construction; fabricated from bronze sheet.
 6. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to **[1/2-inch (13-mm) fire-retardant-treated particleboard][manufacturer's standard honeycomb core][manufacturer's standard formed metal panels]** with **[plastic-laminate panel backing and]** manufacturer's standard protective edge trim. Panels to have a flame-spread index of **[25][75]** or less, when tested in accordance with ASTM E84. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 7. Fabricate car with recesses and cutouts for signal equipment.
 8. Fabricate car door frame integrally with front wall of car.
 9. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 10. Primed or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied, rust-resistant primer or powder-coating for field painting.
 11. Stainless Steel Doors: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning]**.
 12. Bronze Doors: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 13. Plastic-Laminate Doors: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled or powder-coated steel doors and covering edges with protective edge trim **[matching return panels]**. Plastic-laminate color, texture, and pattern as

- selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
- 14. Unfinished-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder-coating.
- 15. Sight Guards: Provide sight guards on car doors.
- 16. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.
- 17. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
- 18. Ceiling: **[Metal][Metallic-finish, plastic-laminate]** flush panels, with **[incandescent downlights in the center of][four low-voltage downlights in]** each panel. **[Align ceiling panel joints with joints between wall panels.]**
- 19. Light Fixture Efficiency: Not less than 35 lumens/W.
- 20. Ventilation Fan Efficiency: Not less than **3.0 cfm/W (1.4 L/s per W)**.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.
 - 1. Where gypsum board wall construction is indicated, frames to be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies to comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible in accordance with **[NFPA 252][or][UL 10B]**.
 - 1. Fire-Protection Rating: **[1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise of 450 deg F (250 deg C)]**.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 - 1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 - 2. Primed or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder-coating for field painting.
 - 3. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
 - 4. Stainless Steel Frames: Formed from stainless steel sheet.
 - 5. Bronze Frames: Formed from cold- or hot-rolled steel sheet, with enamel or powder-coat finish, and with formed-bronze sheet laminated to steel frames using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 - 6. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than **3 inches (76 mm)** high, on both jambs of hoistway door frames.
 - 7. Enameled or Powder-Coated Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 - 8. Primed or Powder-Coated Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder-coating for field painting.
 - 9. Stainless Steel Doors and Transoms: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal]**

- without telegraphing or oil-canning].**
10. Bronze Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 11. Plastic-Laminate Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled or powder-coated steel doors and covering edges with protective edge trim **[matching door frames]**. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 12. Unfinished-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder-coating.
 13. Sight Guards: Provide sight guards on doors matching door edges.
 14. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.
 15. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide **[vandal-resistant]** buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard **[recessed][or][semirecessed]** car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Firefighters' Two-Way Telephone Communication Service: Provide **[flush-mounted cabinet][telephone jack]** in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**
- F. Car Position Indicator: Provide **[illuminated,]**digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- G. Hall Push-Button Stations: **[Provide one hall push-button station at each landing][Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group][Provide hall push-button stations at each**

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Elevators

landing as indicated].

1. Provide **[manufacturer's standard wall-mounted units][units with flat faceplate for mounting with body of unit recessed in wall]**.
 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 - a. Provide for connecting units to building security access system so a card reader can be used to register calls.
 3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**
- H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide **[one of]** the following:
1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
 2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
 3. Units mounted in both jambs of entrance frame **[for each elevator]**.
 4. Units mounted in both car door jambs; **may be used only for single elevators or for two-car groups]**.
- I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
1. At manufacturer's option, audible signals may be placed on cars.
- J. Hall Position Indicators: Provide **[illuminated,]**digital-display-type position indicators, located above **[each]** hoistway entrance at ground floor. Provide units with flat faceplate and with body of unit recessed in wall.
1. Integrate ground-floor hall lanterns with hall position indicators.
- K. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. **[For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.]**
- L. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.
- M. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.
- N. **<Insert requirements>**.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- D. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304 with embossed texture rolled into exposed surface.
 - 1. Product: Subject to compliance with requirements, provide "<Insert product name or designation>" by <Insert manufacturer's name>.
 - 2. Metal surface is [satin polished][satin relieved][titanium nitride colored][oxide colored][satin polished and titanium nitride colored][satin relieved and titanium nitride colored][satin polished and oxide colored][satin relieved and oxide colored][color coated and satin relieved][color coated and bright relieved] after texturing.
- E. Stainless Steel Bars: ASTM A276/A276M, Type 304.
- F. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- G. Bronze Plate and Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal).
- H. Bronze Extrusions: ASTM B455/B455M, Alloy UNS No. C38500 (architectural bronze).
- I. Bronze Tubing: ASTM B135/B135M, Alloy UNS No. C23000 (red brass, 85 percent copper).
- J. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- K. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500 or UNS No. C77600.
- L. Plastic Laminate: High-pressure type complying with ISO 4586-3, **[Type HGS for flat applications][Type HGL for flat applications][Type HGP for postformed applications][and][Type BKV for panel backing]**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

- A. Comply with manufacturer's written instructions.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: **1/8 inch (3 mm)**, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
 - 2. Place hall lanterns either above or beside each hoistway entrance.
 - 3. Mount hall lanterns at a minimum of **72 inches (1829 mm)** above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Operating Test: Load **[elevator][each elevator][one elevator of each type, capacity, speed, and travel distance]** to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: **[Limit temporary use for construction purposes to one elevator.]** Comply with the following requirements for **[each]** elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] elevator(s).
- B. Check operation of[**each**] elevator with Owner's personnel present before date of Substantial Completion[**and again not more than one month before end of warranty period**]. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies to be manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.
- B. **<Insert elevator maintenance agreement>**.

END OF SECTION 14 21 23 00

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14 - Conveying Equipment

Task	Specification	Specification Description
14 21 23 00	14 21 00 00	Electric Traction Elevators
14 21 23 13	14 21 23 00	Machine Room-Less Electric Traction Passenger Elevators

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SECTION 14 24 00 00 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hydraulic elevators.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 - 3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 4. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 - 5. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other structural-steel preparations for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills that are part of steel frame.
 - 6. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
 - 7. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
 - 8. Section 057000 "Decorative Metal" for combination hall push-button stations.
 - 9. Section <Insert Section number> "<Insert Section title>" for finish flooring in elevator cars.
 - 10. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
 - 11. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
 - 12. Section 142413 "Hydraulic Freight Elevators" for hydraulic elevators that are used primarily for carrying freight and are inaccessible to the general public.
 - 13. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
 - 14. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair conductors used for telephone service for elevators[and for Internet connection to elevator controllers for remote monitoring of elevator performance if required].
 - 15. [Section 284600 "Fire Detection and Alarm"] [and] [Section 284614 "Single- and Multiple-Station Alarms"] for smoke detectors in elevator lobbies to initiate emergency recall operation[and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation] and for connection to elevator controllers.
 - 16. Section 312000 "Earth Moving" for excavating well hole to accommodate cylinder assembly and for the disposition of excavated material from the cylinder well hole.

1.2 ALLOWANCES

- A. Elevator Car Allowances: Provide finished passenger[**and service**] elevator cars under the Elevator Car Allowance specified in Section 012100 "Allowances." Allowance includes furnishing and installing the following:
1. Car wall finishes, including trim.
 2. Car floor finishes.
 3. Car ceiling finishes.
 4. Car door finishes.
 5. Hoistway door[**and frame**] finishes.
 6. Car light fixtures.
 7. Handrails.
 8. Cutouts and other provisions for installing elevator signal equipment in cars.

1.3 UNIT PRICES

- A. Unit Prices: Rock excavation for cylinder well holes is paid for under the unit price indicated in the Contract and as specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.
- B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
 2. Include large-scale layout of car-control station[**and standby-power operation control panel**].
 3. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, **3-inch- (75-mm-)** square Samples of sheet materials and **4-inch (100-mm)** lengths of running trim members.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as indicated on Drawings, and electrical service[**including standby-power generator**], as indicated and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44[**including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal:
 - 1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 - 2. Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

14 - Conveying Equipment

1.10 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Furnish well casing and coordinate delivery with related excavation work.
- C. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.11 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HYDRAULIC ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[American Crescent Elevator Mfg., Corp.]**
 - 2. **[Fujitec America, Inc]**
 - 3. **[KONE Inc]**
 - 4. **[MEI]**
 - 5. **[Mowrey Elevator Co.]**
 - 6. **[Otis Worldwide Corporation]**
 - 7. **[Schindler Elevator Corp]**
 - 8. **[Schumacher Elevator Co]**
 - 9. **[ThyssenKrupp Elevator]**
 - 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[American Crescent Elevator Mfg., Corp.]**
 - 2. **[Fujitec America, Inc]**
 - 3. **[KONE Inc]**
 - 4. **[MEI]**
 - 5. **[Mowrey Elevator Co.]**
 - 6. **[Otis Worldwide Corporation]**

7. [Schindler Elevator Corp]
8. [Schumacher Elevator Co]
9. [ThyssenKrupp Elevator]
10. <Insert manufacturer's name>

C. Source Limitations: Obtain elevators[, **including freight and electric traction passenger elevators specified in other Sections,**] from single manufacturer.

1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, are manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Standard: Comply with applicable provisions in [**the United States Access Board's ADA-ABA Accessibility Guidelines**][and][**ICC A117.1**].
- C. Seismic Performance: Elevator system withstands the effects of earthquake motions determined according to [**ASCE/SEI 7**]**<Insert requirement>** and complies with elevator seismic requirements in ASME A17.1/CSA B44.
 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[**and the system will be fully operational after the seismic event**]."
 2. Project Seismic Design Category: [**C**][**D**][**E**][**F**].
 3. Elevator Component Importance Factor: [**1.5**][**1.0**].
 4. Design earthquake spectral response acceleration short period (Sds) for Project is **<Insert value>**.
 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
 6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components are used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
 1. Group Number: **<Insert a different number for each group of elevators that share a group operation system>**.
 2. Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>**.
 3. Emergency Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>**.
 4. Service Elevator Number(s): **<Insert elevator number(s) as indicated on Drawings>**.
 5. Type:
 - a. Under-the-car single cylinder.
 - b. Holeless, beside-the-car, single-acting, [**single**][**dual**] cylinder.
 - c. Holeless, beside-the-car, telescoping, [**single**][**dual**] cylinder.
 - d. Holeless, beside-the-car, roped hydraulic, [**single**][**dual**] cylinder.
 6. Rated Load: [**2000 lb (908 kg)**][**2100 lb (953 kg)**][**2500 lb (1135 kg)**][**3000 lb (1362 kg)**][**3500 lb**

- (1589 kg)][4000 lb (1816 kg)][4500 lb (2043 kg)][5000 lb (2270 kg)]<Insert value>.
7. Freight Loading Class for Service Elevators: Class A.
 8. Rated Speed: [75 or 80 fpm (0.38 or 0.41 m/s)][100 fpm (0.51 m/s)][125 fpm (0.64 m/s)][150 fpm (0.76 m/s)][175 fpm (0.89 m/s)][200 fpm (1.0 m/s)]<Insert value>.
 9. Operation System: [Single automatic operation][Selective-collective automatic operation][Group automatic operation].
 10. Auxiliary Operations:
 - a. Standby-power operation.
 - b. Standby-powered lowering.
 - c. Battery-powered lowering.
 - d. Automatic dispatching of loaded car.
 - e. Nuisance call cancel.
 - f. Loaded-car bypass.
 - g. Off-peak operation
 - h. Automatic operation of lights and ventilation fans.
 - i. [Emergency hospital][Priority] service at [all]<Insert floor designations> floors.
 - j. Independent service for [service elevator][one car in group][all cars in group].
 11. Security Features: [Card-reader operation][Keyswitch operation][Keypad operation][Car-to-lobby feature].
 12. Dual Car-Control Stations: Provide two car-control stations[in each elevator]; equip only one with required keyswitches if any.
 13. Car Enclosures:
 - a. Inside Width: [Not less than][64 inches (1626 mm)][66 inches (1676 mm)][68 inches (1727 mm)][70 inches (1778 mm)][80 inches (2032 mm)][89-1/2 inches (2273 mm)][92 inches (2337 mm)]<Insert dimension> from side wall to side wall.
 - b. Inside Depth: [Not less than][51 inches (1295 mm)][53 inches (1346 mm)][56-1/2 inches (1435 mm)][60 inches (1524 mm)][64-1/2 inches (1638 mm)][66 inches (1676 mm)][68 inches (1727 mm)][88 inches (2235 mm)][89 inches (2261 mm)][90-1/2 inches (2298 mm)][93-1/2 inches (2375 mm)][95 inches (2413)][96-1/2 inches (2451 mm)][101 inches (2565 mm)][102 inches (2591 mm)][104 inches (2641 mm)][108 inches (2743 mm)]<Insert dimension> from back wall to front wall (return panels).
 - c. Inside Height: Not less than [93 inches (2362 mm)]<Insert dimension> to underside of ceiling.
 - d. Front Walls (Return Panels): [Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered] with integral car door frames.
 - e. Car Fixtures: [Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
 - f. Side and Rear Wall Panels: [Enameled or powder-coated steel][Plastic laminate][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Satin bronze, lacquered].
 - g. Reveals: [Black][Enameled or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
 - h. Door Faces (Interior): [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - i. Door Sills: [Aluminum][Bronze][Nickel silver].
 - j. Ceiling: [Luminous ceiling][Enameled or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No.

- 4 finish**[[Polished bronze, lacquered]][Reflective metallic-finished plastic laminate, resembling stainless steel][Reflective metallic-finished plastic laminate, resembling bronze].
- k. Handrails: [1-1/2 inches (38 mm) round][1/2 by 2 inches (13 by 50 mm) rectangular]<Insert dimension(s)>[anodized aluminum][mirror-polished stainless steel][satin stainless steel][mirror-polished bronze, lacquered][satin bronze, lacquered], at [sides][and][rear] of car.
 - l. Floor: Manufacturer's standard carpet.
 - m. Floor prepared to receive carpet (specified in Section 096816 "Sheet Carpeting").
 - n. Floor prepared to receive resilient flooring (specified in Section 096500 "Resilient Flooring").
 - o. Floor recessed and prepared to receive [dimension stone tile (specified in Section 093033 "Stone Tiling")][ceramic tile (specified in Section 093013 "Ceramic Tiling")].
 - p. Floor Thickness, Including Setting Materials: <Insert thickness> above plywood subfloor.
14. Hoistway Entrances:
- a. Width: [36 inches (914 mm)][42 inches (1067 mm)][48 inches (1219 mm)][54 inches (1372 mm)]<Insert dimension>.
 - b. Height: [84 inches (2134 mm)]<Insert dimension>.
 - c. Type: [Single-speed side sliding][Two-speed side sliding][Single-speed center opening][Two-speed center opening].
 - d. Frames: [At first floor.][At basement floors.][Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
 - e. Frames at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered].
 - f. Doors and Transoms: [At first floor.][At basement floors.][Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - g. Doors and Transoms at Other Floors: [Enameled or powder-coated steel][Primed or powder-coated steel][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel][Polished bronze, lacquered][Satin bronze, lacquered][Plastic laminate].
 - h. Sills: [At first floor.][At basement floors.][Aluminum][Bronze][Nickel silver].
 - i. Sills at Other Floors: [Aluminum][Bronze][Nickel silver].
15. Hall Fixtures: [At first floor.][At basement floors.][Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].
16. Hall Fixtures at Other Floors: [Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Polished bronze, lacquered][Satin bronze, lacquered][Recessed type with no exposed-metal surfaces].
17. Additional Requirements:
- a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from [polished stainless steel, ASTM A480/A480M, No. 8 finish][satin stainless steel, ASTM A480/A480M, No. 4 finish][polished bronze, lacquered][satin bronze, lacquered].
 - b. Provide hooks for protective pads in [service car][all cars] and [one][two]<Insert

number> complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

- A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
 - 1. Pump is **[submersible type with submersible squirrel-cage induction motor, and suspended inside oil tank from vibration isolation mounts][or][is tank-top-mounted type with fan-cooled, squirrel-cage induction motor, and is mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch- (25-mm-) thick, glass-fiber insulation board].**
 - 2. Motor has **[wye-delta][or][solid-state]** starting.
 - 3. Motor has variable-voltage, variable-frequency control.
- B. Hydraulic Silencers: System has hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.
- C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.
 - 1. Cylinder units are connected with dielectric couplings.
 - 2. Casing for Underground Piping: Schedule 40 PVC pipe complying with ASTM D1785, joined with PVC fittings complying with ASTM D2466 and solvent cement complying with ASTM D2564.
- D. Hydraulic Fluid:
 - 1. Hydraulic Fluid, Manufacturer's Standard: Elevator manufacturer's standard **[fire-resistant]** fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.
 - 2. Hydraulic Fluid, Nontoxic and Biodegradable: Nontoxic, biodegradable[, **fire-resistant**] fluid, made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives, that is approved by elevator manufacturer for use with elevator equipment.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Hydro Safe Oil Division, Inc.]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Hydro Safe Oil Division, Inc.]**
 - 2) **<Insert manufacturer's name>**
- E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- F. Protective Cylinder Casing: PVC or HDPE pipe casing complying with ASME A17.1/CSA B44, of

sufficient size to provide not less than **1-inch (25-mm)** clearance from cylinder and extending above pit floor. Casing has means of monitoring effectiveness to comply with ASME A17.1/CSA B44.

- G. Corrosion-Protective Filler: A nontoxic, petroleum-based gel formulated for filling the space between hydraulic cylinder and protective casing. Filler is electrically nonconductive, displaces or absorbs water, and gels or solidifies at temperatures below **60 deg F (16 deg C)**.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Hydro Safe Oil Division, Inc.]**
 - b. **[Union Gard; a division of Enduratech LLC]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hydro Safe Oil Division, Inc.]**
 - b. **[Union Gard; a division of Enduratech LLC]**
 - c. **<Insert manufacturer's name>**
- H. Car Frame and Platform: Welded**[or bolted]** steel units.
- I. Guides: **[Roller guides][Polymer-coated, nonlubricated sliding guides][or][sliding guides with guide-rail lubricators]**. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Standby-Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at **[main lobby][fire command station]<Insert location>**. Manual operation causes automatic operation to cease.
 - 2. Single-Car Standby-Powered Lowering:
 - a. On activation of standby power, if car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its doors, and shuts down.
 - b. On activation of standby power, car is lowered to the lowest floor, opens its doors, and shuts down.
 - 3. Single-Car Battery-Powered Lowering:
 - a. If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its

- doors, and shuts down. System includes rechargeable battery and automatic recharging system.
 - b. When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
4. Group Standby-Power Operation:
- a. On activation of standby power, cars are returned to a designated floor and parked with doors open. Only one car is moved upward at a time, with priority given to loaded cars. If a car cannot be returned after two attempts, it is removed from the system. When all cars have been returned or removed from the system, one car is automatically placed in service. If car selected for service cannot operate within 60 seconds, the system removes car from service and places another car in service. Cars can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at **[main lobby][fire command station]<Insert location>**. Manual operation causes automatic operation to cease.
 - b. On activation of standby power, cars are returned to lowest floor and parked with doors open. If a car cannot be returned, it is removed from the system. One car is selected for service on standby power by a switch located at **[main lobby][fire command station]<Insert location>**.
5. Group Standby-Powered Lowering:
- a. On activation of standby power, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are lowered to a preselected floor, open their doors, and shut down. Cars that are below the preselected floor are lowered to the next lower floor, open their doors, and shut down.
 - b. On activation of standby power, cars are lowered to the lowest floor, open their doors, and shut down.
6. Group Battery-Powered Lowering:
- a. If power fails, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are lowered to a preselected floor, open their doors, and shut down. Cars that are below the preselected floor are lowered to the next lower floor, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.
 - b. When power fails, cars are lowered to the lowest floor, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.
7. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors start closing.
8. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls **[and predetermined weight]** can be adjusted.
9. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
10. Off-Peak Operation: During periods of low traffic, half of the elevators in a group are taken out of service and switched to low-power mode.
11. Independent Service: Keyswitch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.
12. Priority Service: Service is initiated by a **[keyswitch][card reader][remote switch]** at designated floors. One elevator is removed from group operation and directed to the floor where service was

initiated. On arriving at the floor, elevator opens its doors and parks[, and a lighted sign directs passengers to exit elevator]. Car is placed in operation by selecting a floor and pressing door close button or by operating keyswitch to put car in independent service. After responding to floor selected or being removed from independent service, car returns to group operation. If car is not placed in operation within a preset time after being called, it is returned to group operation.

13. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.

C. Security Features: Security features do not affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at **[car-control stations][and][hall push-button stations]** to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. **[Allow space for card reader in car][Provide stripe-swipe card reader integral with each car-control station]**.
 - a. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**
2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at **[car-control stations][and][hall push-button stations]**. Key is removable **[only in deactivated position][in either position]**.
3. Keypad Operation: Allows each landing to be restricted or unrestricted. When a restricted landing button is pressed, a "Restricted Floor" lamp lights and remains lit until landing access code has been entered into a keypad or predetermined time period has elapsed. Car calls for restricted landings do not register until landing access code is entered into keypad within predetermined time period after landing button is pressed.
 - a. Access codes are programmed at each car operating panel using a security keyswitch. Keypad operation can be activated and deactivated by security keyswitch at main landing.
4. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes **[car][all cars in a group]** to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR-REOPENING DEVICES

- A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door-reopening device, a loud buzzer sounds and doors begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. Provide **[enameled- or powder-coated-steel car enclosures to receive removable][steel-framed car enclosures with nonremovable]** wall panels, with **[removable]** car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
2. See "Allowances" Article for items to be provided under the Elevator Car Allowance. Provide items not included in the Elevator Car Allowance as needed for finished car[, **including materials and finishes specified below**].

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor:
 - a. Exterior, underlayment-grade plywood, not less than **5/8-inch (15.9-mm)** nominal thickness.
 - b. Exterior, C-C Plugged grade plywood, not less than **7/8-inch (22.2-mm)** nominal thickness.
2. Floor Finish:
 - a. Specified in **<Insert Section number> "<Insert Section title>."**
 - b. Elevator manufacturer's standard level-loop nylon carpet; color as selected by Architect from manufacturer's full range.
3. Enameled- or Powder-Coated-Steel Wall Panels: Flush, formed-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
4. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
5. Bronze Wall Panels: Flush, formed-metal construction; fabricated from bronze sheet.
6. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to **[1/2-inch (13-mm) fire-retardant-treated particleboard][manufacturer's standard honeycomb core][manufacturer's standard formed metal panels]** with **[plastic-laminate panel backing and]** manufacturer's standard protective edge trim. Panels have a flame-spread index of **[25][75]** or less, when tested according to ASTM E84. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
7. Fabricate car with recesses and cutouts for signal equipment.
8. Fabricate car door frame integrally with front wall of car.
9. Enameled- or Powder-Coated-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
10. Primed or Powder-Coated-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder coating for field painting.
11. Stainless Steel Doors: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled- or powder-coated-steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning]**.
12. Bronze Doors: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled- or powder-coated-steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
13. Plastic-Laminate Doors: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled- or powder-coated-steel doors and covering edges with protective edge trim **[matching return panels]**. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
14. Unfinished-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder coating.
15. Sight Guards: Provide sight guards on car doors.
16. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.

17. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
18. Ceiling: **[Metal][Metallic-finish, plastic-laminate]** flush panels, with **[incandescent downlights in the center of][four low-voltage downlights in]** each panel. **[Align ceiling panel joints with joints between wall panels.]**
19. Light Fixture Efficiency: Not less than 35 lumens/W.
20. Ventilation Fan Efficiency: Not less than **3.0 cfm/W (1.4 L/s per W)**.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile accommodate hoistway wall construction.
 1. Where gypsum board wall construction is indicated, frames are self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
 1. Fire-Protection Rating: **[1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise of 450 deg F (250 deg C)]**.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 1. Enameled- or Powder-Coated-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 2. Primed or Powder-Coated-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder coating for field painting.
 3. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
 4. Stainless Steel Frames: Formed from stainless steel sheet.
 5. Bronze Frames: Formed from cold- or hot-rolled steel sheet, with enamel or powder-coat finish, and with formed-bronze sheet laminated to steel frames using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 6. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than **3 inches (76 mm)** high, on both jambs of hoistway door frames.
 7. Enameled- or Powder-Coated-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 8. Primed or Powder-Coated-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, rust-resistant primer or powder-coating for field painting.
 9. Stainless Steel Doors and Transoms: Flush, hollow-metal construction; fabricated **[from stainless steel sheet][or][by laminating stainless steel sheet to exposed faces and edges of enameled- or powder-coated-steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning]**.
 10. Bronze Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating bronze sheet to exposed faces and edges of enameled- or powder-coated-steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 11. Plastic-Laminate Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled- or powder-coated-steel doors and covering edges with protective edge trim **[matching door frames]**. Plastic-laminate color, texture, and pattern as

- selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
- 12. Unfinished-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, with factory-applied enamel or powder-coating.
- 13. Sight Guards: Provide sight guards on doors matching door edges.
- 14. Sills: Extruded or machined metal, with grooved surface, **1/4 inch (6.4 mm)** thick.
- 15. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide **[vandal-resistant]** buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard **[recessed][or][semirecessed]** car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
 - 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Firefighters' Two-Way Telephone Communication Service: Provide **[flush-mounted cabinet][telephone jack]** in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**
- F. Car Position Indicator: Provide **[illuminated,]**digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- G. Hall Push-Button Stations: **[Provide one hall push-button station at each landing][Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group][Provide hall push-button station at each landing as indicated].**
 - 1. Provide **[manufacturer's standard wall-mounted units][units with flat faceplate for mounting with body of unit recessed in wall][jamb-mounted units]**.
 - 2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.
 - 3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and**

Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]

- H. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide **[one of]** the following:
1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
 2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
 3. Units mounted in both jambs of entrance frame **[for each elevator]**.
 4. Units mounted in both car door jambs **[; may be used only for single elevators or for two-car groups]**.
- I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
1. At manufacturer's option, audible signals may be placed on cars.
- J. Hall Position Indicators: Provide **[illuminated,]**digital-display-type position indicators, located above **[each]** hoistway entrance at ground floor.
1. Provide units **[with flat faceplate for mounting and with body of unit recessed in wall][integral with entrance head jamb]**.
 2. Integrate ground-floor hall lanterns with hall position indicators.
- K. Standby-Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. **[For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.]**
- L. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby-power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.
- M. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.
- N. **<Insert requirements>**.
- 2.10 FINISH MATERIALS
- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
 - B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
 - C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
 - D. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304, with embossed texture rolled into exposed surface.

1. Product: Subject to compliance with requirements, provide "<Insert product name>" by <Insert manufacturer's name>.
 2. Metal surface is [satin polished][satin relieved][titanium nitride colored][oxide colored][satin polished and titanium nitride colored][satin relieved and titanium nitride colored][satin polished and oxide colored][satin relieved and oxide colored][color coated and satin relieved][color coated and bright relieved] after texturing.
- E. Stainless Steel Bars: ASTM A276/A276M, Type 304.
- F. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- G. Bronze Plate and Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal).
- H. Bronze Extrusions: ASTM B455/B455M, Alloy UNS No. C38500 (architectural bronze).
- I. Bronze Tubing: ASTM B135/B135M, Alloy UNS No. C23000 (red brass, 85 percent copper).
- J. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- K. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500 or No. C77600.
- L. Plastic Laminate: High-pressure type complying with ISO 4586-3, [Type HGS for flat applications][Type HGL for flat applications][Type HGP for postformed applications][and][Type BKV for panel backing].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HYDRAULIC ELEVATORS

- A. Excavation for Cylinder: Drill well hole in[**each**] elevator pit to accommodate installation of cylinder; comply with applicable requirements in Section 312000 "Earth Moving."
- B. Provide[**waterproof**] well casing[**as necessary**] to retain well-hole walls.
- C. Install cylinder in protective casing within well hole. Before installing protective casing, remove water and debris from well hole[**and provide permanent waterproof seal at bottom of well casing**].
 1. Fill void space between protective casing and cylinder with corrosion-protective filler.
 2. Align cylinder and fill space around protective casing with fine sand.
- D. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in

place, supported at pit floor. Seal between [well][protective] casing and pit floor with **4 inches (100 mm)** of nonshrink, nonmetallic grout.

- E. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- F. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.
- G. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- H. Install piping above the floor, where possible. Install underground piping in casing.
 - 1. Excavate for piping and backfill encased piping according to applicable requirements in Section 312000 "Earth Moving."
- I. Lubricate operating parts of systems as recommended by manufacturers.
- J. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- K. Leveling Tolerance: **1/4 inch (6 mm)**, up or down, regardless of load and travel direction.
- L. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- M. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
 - 2. Place hall lanterns either above or beside each hoistway entrance.
 - 3. Mount hall lanterns at a minimum of **72 inches (1829 mm)** above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: **[Limit temporary use for construction purposes to one elevator.]** Comply with the following requirements for **[each]** elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to

- protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] elevator(s).
- B. Check operation of[**each**] elevator with Owner's personnel present before date of Substantial Completion[**and again not more than one month before end of warranty period**]. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies are manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.
- B. **<Insert elevator maintenance agreement>**.

END OF SECTION 14 24 00 00

SECTION 14 24 13 00 - HYDRAULIC FREIGHT ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydraulic freight elevators.

B. Related Requirements:

1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
 2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 4. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry.
 5. Section 051200 "Structural Steel Framing" for the following:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills[**and entrance frames**] that are part of steel frame.
 6. Section 055000 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for [subsills][and][entrance frames].
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
 7. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
 8. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
 9. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
 10. Section 271513 "Communications Copper Horizontal Cabling" for telephone service for elevators.
 11. **[Section 284621.11 "Addressable Fire-Alarm Systems"]****[Section 284621.13 "Conventional Fire-Alarm Systems"]** for smoke detectors in elevator lobbies to initiate emergency recall operation[**and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation**] and for connection to elevator controllers.
 12. Section 312000 "Earth Moving" for excavating well hole to accommodate cylinder assembly.
- C. Unit Prices: Rock excavation for cylinder well holes is paid for under the unit price indicated in the Contract and as specified in Section 012200 "Unit Prices."

14 - Conveying Equipment

1.2 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service[**including standby power generator**], as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's/installer's standard operation and maintenance manual, according to ASME A17.1[**including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal:

1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one-year][two-year][five-year]<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
2. Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Furnish well casing and coordinate delivery with related excavation work.
- C. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic freight elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace elevator work that fails in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HYDRAULIC FREIGHT ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [American Crescent Elevator Mfg., Corp.]
2. [Fujitec America, Inc]
3. [KONE Inc]
4. [MEI]
5. [Mowrey Elevator Co.]
6. [Otis Worldwide Corporation]
7. [Schindler Elevator Corp]
8. [Schumacher Elevator Co]
9. [ThyssenKrupp Elevator]
10. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [American Crescent Elevator Mfg., Corp.]
2. [Fujitec America, Inc]
3. [KONE Inc]
4. [MEI]
5. [Mowrey Elevator Co.]
6. [Otis Worldwide Corporation]
7. [Schindler Elevator Corp]
8. [Schumacher Elevator Co]
9. [ThyssenKrupp Elevator]
10. <Insert manufacturer's name>

C. Source Limitations: Obtain freight elevators[, including electric traction freight elevators specified in Section 142100 "Electric Traction Elevators,"] from single manufacturer.

1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement> and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[and the system will be fully operational after the seismic event]."
2. Project Seismic Design Category: [C][D][E][F].
3. Elevator Component Importance Factor: [1.5][1.0].
4. Design earthquake spectral response acceleration short period (Sds) for Project is <Insert value>.

2.3 FREIGHT ELEVATORS

- A. Elevator System, General: Manufacturer's standard hydraulic freight elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
 1. Elevator Number(s): **<Insert elevator number(s) as shown on Drawings>**.
 2. Type:
 - a. Under-the-car **[single][or][dual]** cylinder.
 - b. Holeless, beside-the-car, single-acting, **[single][dual]** cylinder.
 - c. Holeless, beside-the-car, telescoping, **[single][dual]** cylinder.
 - d. Holeless, beside-the-car, roped hydraulic, **[single][dual]** cylinder.
 3. Rated Load: **[2000 lb (908 kg)][2500 lb (1135 kg)][3000 lb (1362 kg)][4000 lb (1816 kg)][5000 lb (2270 kg)][6000 lb (2720 kg)][8000 lb (3632 kg)][10,000 lb (4540 kg)]<Insert value>**.
 4. Freight Loading Class: **[Class A][Class B][Class C1][Class C2][Class C3]**.
 5. Rated Speed (Up): **[50 fpm (0.25 m/s)][75 or 80 fpm (0.38 or 0.41 m/s)][100 fpm (0.51 m/s)]<Insert value>**.
 6. Operational Speed (Down): **[Approximately 30 percent more than][Same as]** rated speed (up).
 7. Operation System: **[Single automatic][Car-switch automatic floor stop][Selective-collective automatic]**.
 8. Auxiliary Operations:
 - a. Battery-powered lowering.
 - b. Standby power operation.
 - c. Load-weighing device.
 - d. Automatic operation of lights and ventilation fans.
 9. Security Features: **[Card-reader][Keyswitch]** operation.
 10. Auxiliary Car-Control Station: Provide additional car-control station mounted on side of car at height to facilitate operation by forklift-truck operator without leaving truck.
 11. Car Enclosures:
 - a. Platform Width: **[60 inches (1524 mm)][64 inches (1626 mm)][66 inches (1676 mm)][76 inches (1930 mm)][78 inches (1981 mm)][88 inches (2235 mm)][100 inches (2540 mm)][102 inches (2591 mm)][124 inches (3150 mm)][126 inches (3200 mm)]<Insert dimension>**.
 - b. Platform Depth: **[72 inches (1829 mm)][84 inches (2134 mm)][96 inches (2438 mm)][120 inches (3048 mm)][144 inches (3658 mm)][168 inches (4267 mm)]<Insert dimension>**.
 - c. Ceiling Height: **[84 inches (2134 mm)][96 inches (2438 mm)][108 inches (2743 mm)]<Insert dimension>**.
 - d. Walls and Ceiling: **[Prime-painted or powder-coated steel][Prime-painted or powder-coated, metallic-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish][Textured stainless steel]**.
 - e. Car Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
 - f. Floor: **[Rolled steel floor plate][Aluminum-alloy rolled tread plate][Rolled stainless steel floor plate]<Insert material>**.
 - g. Car Gate Type: **[Vertical biparting][Single-speed vertical lift][Two-speed vertical lift]**.
 - h. Car Gate Operation: **[Manual][Power operated]**.
 - i. Car Gate Material: **[Prime-painted or powder-coated steel][Satin stainless steel]**.
 - j. Car Sill: Steel angle.
 - k. Lighting:

- 1) [One][Two][Three] 48-inch (1219-mm), [suspended,][surface-mounted,] two-tube fluorescent light fixture(s) with [white reflectors][and][wire lamp guards].
 - 2) [One][Two] 48-inch (1219-mm), recessed, [two][three]-tube fluorescent light fixture(s) with UV-stabilized acrylic diffusers not less than 0.125 inch (3.2 mm) thick.
- l. Light Fixture Efficiency: Not less than 35 lumens/W.
 - m. Ventilation Fan Efficiency: Not less than 3.0 cfm/W (1.4 L/s per W).
12. Hoistway Entrances:
- a. Width: [56 inches (1422 mm)][60 inches (1524 mm)][62 inches (1575 mm)][72 inches (1829 mm)][96 inches (2438 mm)][98 inches (2489 mm)][120 inches (3048 mm)][122 inches (3099 mm)]<Insert dimension>.
 - b. Height: [84 inches (2134 mm)][96 inches (2438 mm)]<Insert dimension>.
 - c. Door Type: [Vertical biparting][Single-speed vertical lift][Two-speed vertical lift].
 - d. Fire-Protection Rating: [1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise of 450 deg F (250 deg C)].
 - e. Door Operation: [Manual][Power operated with door reopening device].
 - f. Door Material: [Prime-painted or powder-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish].
 - g. Door Frame Material: [Prime-painted or powder-coated steel][Satin stainless steel, ASTM A480/A480M, No. 4 finish].
13. Hall Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
14. Auxiliary Hall Stations: Provide additional pendant-mounted, hall push-button stations[**where indicated**] mounted at height to facilitate operation by forklift-truck operator without leaving truck.

2.4 SYSTEMS AND COMPONENTS

- A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
 1. Pump shall be [submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts][or][tank-top-mounted type with fan-cooled, squirrel-cage induction motor and shall be mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch- (25-mm-) thick, glass-fiber insulation board].
 2. Motor shall have [wye-delta][or][solid-state] starting.
- B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.
- C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.
 1. Cylinder units shall be connected with dielectric couplings.
 2. Casing for Underground Piping: Schedule 40 PVC pipe complying with ASTM D1785, joined with PVC fittings complying with ASTM D2466 and solvent cement complying with ASTM D2564.
- D. Hydraulic Fluid:
 1. Elevator manufacturer's standard [fire-resistant]fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.
 2. Fluid: Nontoxic, biodegradable[, fire-resistant] fluid made from vegetable oil with antioxidant,

- anticorrosive, antifoaming, and metal-passivating additives and approved by elevator manufacturer for use with elevator equipment.
3. Product: Subject to compliance with requirements, provide "Hydro Safe" by Hydro Safe Oil Division, Inc.
 - E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
 - F. Protective Cylinder Casing: PVC or HDPE pipe casing complying with ASME A17.1/CSA B44, of sufficient size to provide not less than **1-inch (25-mm)** clearance from cylinder and extending above pit floor. Casing shall have method of monitoring effectiveness of complying with ASME A17.1/CSA B44.
 - G. Corrosion-Protective Filler: A nontoxic, petroleum-based gel formulated for filling the space between hydraulic cylinder and protective casing. Filler shall be electrically nonconductive, displace or absorb water, and gel or solidify at temperatures below **60 deg F (16 deg C)**.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hydro Safe Oil Division, Inc.]**
 - b. **[Union Gard; a division of Enduratech LLC]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hydro Safe Oil Division, Inc.]**
 - b. **[Union Gard; a division of Enduratech LLC]**
 - c. **<Insert manufacturer's name>**
 - H. Car Frame and Platform: Welded **[or bolted]** steel units.
 1. Provide special heavy-duty units for power truck loading, designed to withstand impacts and wheel loadings indicated.
 - I. Guides: **[Roller guides][Polymer-coated, nonlubricated sliding guides][or][sliding guides with guide-rail lubricators]**. Provide guides at top and bottom of car and counterweight frames.
- 2.5 OPERATION SYSTEMS
- A. Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
 - B. Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
 - C. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power by a switch in control panel located at **[main lobby][fire command station]<Insert location>**.
 - D. Group Standby Power Operation: On activation of standby power, cars, including passenger elevator

cars specified in other sections, are returned one car at a time to a designated floor and parked with doors open. If a car cannot be returned, it is removed from the system. One car is selected for service on standby power by a switch in control panel located at **[main lobby][fire command station]<Insert location>**.

- E. Load-Weighing Device: When car load exceeds 80 percent of rated capacity, a signal light is lit in the car-control station; when car load exceeds rated capacity, car does not respond to car or hall calls.
- F. Security Features: Security features shall not affect emergency firefighters' service.
 - 1. Card-Reader Operation: System uses card readers at **[car-control stations][and][hall push-button stations]** to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. **[Allow space for card reader in car][Provide stripe-swipe card reader integral with each car-control station]**.
 - a. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**
 - 2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at **[car-control stations][and][hall push-button stations]**. Key is removable **[only in deactivated position][in either position]**.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES

- A. Provide car enclosures as indicated, including ventilation, lighting, finishes, access doors, thresholds, trim, and accessories. Fabricate with recesses and cutouts for signal equipment.
 - 1. Provide power door operators with linkages for hoistway door operation.
 - 2. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Fabrication: Provide manufacturer's standard, flush panel, welded construction made from metal sheet, of metal indicated, not less than **0.067 inch (1.7 mm)** and reinforced at **16-inch (406-mm)** maximum spacing.
 - 1. Provide perforated panels for ceiling and for walls above **72 inches (1829 mm)** from car floor unless required to be solid by ASME A17.1/CSA B44.
- C. **<Insert requirements>**.

2.8 HOISTWAY ENTRANCES

- A. Unless otherwise indicated, provide hoistway entrance doors of type indicated below, with truckable sill

bars and resilient safety meeting-rail gaskets.

1. Equip for power operation by coordinated linkage with power-operated car door.
 2. Where gypsum board wall construction is indicated, provide fire-resistance-rated, hollow-metal, door-and-frame hoistway entrances. Provide self-supporting frames with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as-close-to-neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
- C. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
1. Metal Door Panels: Constructed of metal sheets, flush on room side, welded and reinforced in steel framing with vertical reinforcing spaced not more than **24 inches (610 mm)** o.c. Fabricate panel faces from metal sheet, of metal indicated, not less than **0.097 inch (2.5 mm)** thick.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs or of acrylic or other permanent, nonyellowing translucent plastic.
- B. Car-Control Stations: Provide manufacturer's standard car-control station. Mount adjacent to car door unless otherwise indicated.
1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 2. Mount controls at heights complying with the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Emergency Communication System: Two-way voice communication system, with visible signal that dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Firefighters' Two-Way Telephone Communication Service: Provide **[flush-mounted cabinet][telephone jack]** in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in **[Section 284621.11 "Addressable Fire-Alarm Systems."]****[Section 284621.13 "Conventional Fire-Alarm Systems."]**
- E. Car Position Indicator: Provide illuminated digital-type car position indicator, located above car door or above car-control station.
- F. Hall Push-Button Stations: Provide hall push-button stations at each landing as indicated.
1. Provide single-button stations with **[position]"in-use"** indicator.
 2. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in **[Section 284621.11 "Addressable Fire-Alarm Systems."]****[Section 284621.13 "Conventional Fire-Alarm Systems."]**

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, commercial steel, with **G60 (Z180)** zinc coating (galvanized) or **A60 (ZF180)** zinc-iron-alloy coating (galvannealed).
- D. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- E. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304 with embossed texture rolled into exposed surface.
 - 1. Product: Subject to compliance with requirements, provide "<Insert product name>" by <Insert manufacturer's name>.
- F. Stainless Steel Bars: ASTM A276, Type 304.
- G. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- H. Rolled Steel Floor Plate: ASTM A786/A786M.
- I. Rolled Stainless Steel Floor Plate: ASTM A793.
- J. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Pattern 1, Alloy 6061-T6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Excavation for Cylinder: Drill well hole in[**each**] elevator pit to accommodate installation of cylinder; comply with applicable requirements in Section 312000 "Earth Moving."
- B. Provide[**waterproof**] well casing[**as necessary**] to retain well-hole walls.
- C. Install cylinder in protective casing within well hole. Before installing protective casing, remove water and debris from well hole[**and provide permanent waterproof seal at bottom of well casing**].
 - 1. Fill void space between protective casing and cylinder with corrosion-protective filler.
 - 2. Align cylinders and fill space around protective casing with fine sand.
- D. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between [well][protective] casing and pit floor with **4 inches (100 mm)** of nonshrink, nonmetallic grout.

- E. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- F. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualifications standards.
- G. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- H. Install piping above the floor, where possible. Install underground piping in casing.
 - 1. Excavate for piping and backfill encased piping according to applicable requirements in Section 312000 "Earth Moving."
- I. Lubricate operating parts of systems as recommended by manufacturers.
- J. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: [**Limit temporary use for construction purposes to one elevator.**]Comply with the following requirements for[**each**] elevator used for construction purposes:
 - 1. Provide protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 2. Do not load elevators beyond their rated weight capacity.
 - 3. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation. Provide the same parts and supplies as those used in the manufacture and installation of original equipment.
 - 4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] elevator(s).

14 - Conveying Equipment



- B. Check operation of **[each]** elevator with Owner's personnel present and before date of Substantial Completion **[and not more than one month before end of warranty period]**. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 - 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.
- B. **<Insert elevator maintenance agreement>**.

END OF SECTION 14 24 13 00



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Task	Specification	Specification Description
14 24 13 00	14 24 00 00	Hydraulic Elevators
14 24 23 00	14 24 00 00	Hydraulic Elevators



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SECTION 14 26 00 00 - LIMITED-USE_LIMITED-APPLICATION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Limited-use/limited-application elevators.

B. Related Requirements:

1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
2. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
3. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry.
4. Section 051200 "Structural Steel Framing" for attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
5. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
6. Section <Insert Section number> "<Insert Section title>" for finish flooring in elevator cars.
7. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair communications cable used for telephone service for elevators[**and for connection to elevator controllers for remote monitoring of elevator performance**].

1.2 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to Work of this Section.
- B. LU/LA: Limited use/limited application.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal equipment.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
2. Indicate loads imposed on building structure at points of support and power requirements.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car finishes, hoistway doors, and frames; **3-inch- (75-mm-)** square Samples.

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1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchoring provisions.
 - 3. Detailed description of equipment anchoring devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as indicated on Drawings, and electrical service, as indicated and specified, are adequate for elevator being provided.
- D. Preinstallation Examination Report: Indicating dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
- E. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's/installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44[**including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel**].
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction, for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard [**one-year**][**two-year**][**five-year**]**<Insert agreement period>** maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer[**or an authorized representative who is trained and approved by manufacturer**].

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to LU/LA elevators including sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIMITED-USE/LIMITED-APPLICATION ELEVATORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[American Crescent Elevator Mfg., Corp.]**
 - 2. **[Custom Elevator Manufacturing, Inc.]**
 - 3. **[Federal Elevator]**
 - 4. **[Liftavator, Inc]**
 - 5. **[National Wheel-O-Vator]**
 - 6. **[Nationwide Lifts, Inc.]**
 - 7. **[Savaria]**
 - 8. **[Schumacher Elevator Co]**
 - 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[American Crescent Elevator Mfg., Corp.]**
 - 2. **[Custom Elevator Manufacturing, Inc.]**
 - 3. **[Federal Elevator]**
 - 4. **[Liftavator, Inc]**
 - 5. **[National Wheel-O-Vator]**
 - 6. **[Nationwide Lifts, Inc.]**
 - 7. **[Savaria]**
 - 8. **[Schumacher Elevator Co]**
 - 9. **<Insert manufacturer's name>**

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with requirements for LU/LA elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system to withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]**<Insert requirement> and comply with elevator seismic requirements in ASME A17.1/CSA B44.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[**and the system will be fully operational after the seismic event**]."
 - 2. Project Seismic Design Category: **[C][D][E][F]**.
 - 3. Elevator Component Importance Factor: **[1.5][1.0]**.
 - 4. Design earthquake spectral response acceleration short period (Sds) for Project is <Insert value>.

2.3 SYSTEMS AND COMPONENTS

- A. Elevator System, General: Manufacturer's standard LU/LA elevator. Unless otherwise indicated, manufacturers' standard components are to be used, as included in standard LU/LA elevators and as required for complete system.
 - 1. Rated Load: **[1400 lb (635 kg)]**<Insert value>.
 - 2. Rated Speed: **[25 to 30 fpm (0.13 to 0.15 m/s)]**<Insert value(s)>.
- B. Machine Type: Hydraulic, holeless, beside the car; direct-acting hydraulic or roped hydraulic.
- C. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
 - 1. Pump to be submersible type,[**with submersible squirrel-cage induction motor**,] suspended inside oil tank from vibration isolation mounts.
 - 2. Motor to have **[solid-state starting][variable-voltage, variable-frequency motor control]**.
 - 3. System to have hydraulic silencer and flexible piping connectors at pump unit.
- D. Hydraulic Fluid: Elevator manufacturer's standard **[fire-resistant]**fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.
- E. Inserts: Furnish required concrete and masonry inserts and similar anchoring devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

2.4 OPERATION SYSTEMS

- A. Provide manufacturer's standard[**microprocessor**] operation system for **[single][selective-collective]** automatic operation.
- B. Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put into service on standby power, either for return

operation or for regular operation, by switches in control panel located at **[main lobby]<Insert location>**. Manual operation causes automatic operation to cease.

- C. Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its car and hoistway doors, and shuts down. System includes rechargeable battery and automatic recharging system.
- D. Provide automatic operation of lights and ventilation fans.
- E. Emergency Operation: **[None required][Phase I emergency recall operation][Phase I emergency recall operation and Phase II emergency in-car operation]**.
- F. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitch. Key is removable **[only in deactivated position][in either position]**.
- G. Card-Reader Operation: System uses card reader to authorize calls. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. Allow space for card reader in car.
 - 1. Security access system equipment is **[specified in Section 281500 "Access Control Hardware Devices."][not in the Contract.]**

2.5 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door-reopening devices with a uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.

2.6 CAR ENCLOSURES

- A. Provide steel-framed car enclosures with wall panels, car roof, access doors, power door operators, and ventilation. Provide finished car including materials and finishes specified below.
- B. Clear Inside Dimensions:
 - 1. Inside Width: **[36 inches (915 mm)][42 inches (1065 mm)][48 inches (1219 mm)]<Insert dimension>** from sidewall to sidewall.
 - 2. Inside Depth: **[48 inches (1219 mm)][54 inches (1370 mm)][60 inches (1524 mm)]<Insert dimension>** from back wall to front wall (return panels).
 - 3. Inside Height: **[84 inches (2134 mm)]<Insert dimension>** to underside of ceiling.
- C. Materials and Finishes: Manufacturer's standards, but not less than the following:
 - 1. Floor Finish:
 - a. Specified in Section **<Insert Section number> "<Insert Section title>."**
 - b. Elevator manufacturer's standard level-loop nylon carpet; color as selected by Architect from manufacturer's full range.
 - 2. Enameled or Powder-Coated Steel Wall Panels: Flush, formed-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 - 3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel

- sheet; [polished, ASTM A480/A480M, No. 8][satin, ASTM A480/A480M, No. 4] finish.
4. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard [core][metal panels] with [plastic-laminate panel backing and] manufacturer's standard protective edge trim. Panels to have a flame-spread index of [25][75] or less, when tested in accordance with ASTM E84. Plastic-laminate color, texture, and pattern as selected by Architect from [plastic-laminate][elevator] manufacturer's full range.
5. Sills: Extruded or machined aluminum, with grooved surface, 1/4 inch (6.4 mm) thick.
6. Metal Ceiling: Flush panels, fabricated from cold-rolled steel sheet. Provide panels with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
7. Lighting: Not less than two downlights. [Provide battery backup power source with automatic charging.]

a. Light Fixture Efficiency: Not less than 35 lumens/watt.

8. Handrail: [1-1/2 inches (38 mm) round][1/2 by 2 inches (13 by 50 mm) rectangular][Manufacturer's standard]<Insert description>[polished stainless steel][satin stainless steel]<Insert material and finish>, [on one side][on both sides][at rear] of car.

D. Car Doors: Manufacturer's standard units complete with track systems, hardware, sills, and accessories.

1. Operation: [Manual][Power-operated, automatic].
2. Type: [Horizontal sliding][Horizontally operated, folding]<Insert description>.
3. Clear Opening Width: [32 inches (815 mm)][36 inches (915 mm)]<Insert dimension>.
4. Door Height: [80 inches (2032 mm)][84 inches (2134 mm)]<Insert dimension>.
5. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
6. Primed-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, corrosion-resistant primer or powder-coating for field painting.
7. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet or by laminating stainless steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning. [Polished, ASTM A480/A480M, No. 8][Satin, ASTM A480/A480M, No. 4] finish.
8. Plastic-Laminate Doors: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled cold-rolled steel doors and covering edges with protective edge trim. Plastic-laminate color, texture, and pattern as selected by Architect from [plastic-laminate][elevator] manufacturer's full range.
9. Aluminum Folding Doors: Aluminum extrusions with edges forming full-height hinges connected by stainless steel rod.

2.7 HOISTWAY ENTRANCES

A. Provide manufacturer's standard door-and-frame hoistway entrances, same size as car doors, complete with track systems, hardware, sills, and accessories.

1. Operation: [Manual][Power-operated, automatic].
2. Type: [Horizontal sliding][Side hinged].

B. Coordinate frame size and profile with hoistway wall construction.

1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.

- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 2. Primed-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied, corrosion-resistant primer or powder-coating for field painting.
 3. Stainless Steel Frames: Formed from stainless steel sheet; **[polished, ASTM A480/A480M, No. 8][satin, ASTM A480/A480M, No. 4]** finish.
 4. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 5. Primed-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied, corrosion-resistant primer or powder-coating for field painting.
 6. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet or by laminating stainless steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning. **[Polished, ASTM A480/A480M, No. 8][Satin, ASTM A480/A480M, No. 4]** finish.
 7. Plastic-Laminate Doors: Flush, hollow-metal construction; fabricated by laminating plastic laminate to exposed faces of enameled cold-rolled steel doors and covering edges with protective edge trim. Plastic-laminate color, texture, and pattern as selected by Architect from **[plastic-laminate][elevator]** manufacturer's full range.
 8. Sills: Extruded or machined aluminum, with grooved surface, **1/4 inch (6.4 mm)** thick.
 9. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.
- D. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies to comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as-close-to-neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
1. Fire-Protection Rating: **[1 hour][1-1/2 hours]<Insert rating>[with 30-minute temperature rise of 450 deg F (250 deg C)]**.

2.8 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide **[vandal-resistant]** buttons and lighted elements illuminated with light-emitting diodes.
1. Finish: **[Polished stainless steel, ASTM A480/A480M, No. 8 finish][Satin stainless steel, ASTM A480/A480M, No. 4 finish]<Insert description>**.
- B. Car-Control Stations: Provide manufacturer's standard car-control stations. Mount in side panel adjacent to car door unless otherwise indicated.
1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Car Position Indicator: Provide digital-type position indicator in elevator car. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include

travel direction arrows if not provided in car-control station.

- E. Hall Push-Button Stations: Wall-mounted or jamb-mounted units equipped with buttons for calling elevator and for indicating desired direction of travel where applicable.
- F. Hall Lanterns: Wall-mounted or jamb-mounted units with illuminated arrows; but provide single arrow at terminal landings.
- G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 - 1. At manufacturer's option, audible signals may be placed on car.
- H. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.9 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- D. Stainless Steel Bars: ASTM A276/A276M, Type 304.
- E. Stainless Steel Tubing: ASTM A554, Grade MT 304.
- F. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063.
- G. Plastic Laminate: High-pressure type complying with ISO 4586-3, **[Type HGS for flat applications][Type HGL for flat applications][and][Type BKV for panel backing]**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF LIMITED-USE/LIMITED-APPLICATION ELEVATORS

- A. Install cylinder plumb and accurately located for elevator car position and travel. Anchor securely in

place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

- B. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise from elevator system.
- C. Lubricate operating parts of systems as recommended by manufacturers.
- D. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Reduce clearances to minimum, safe, workable dimension at each landing.
- E. Leveling Tolerance: **1/4 inch (6 mm)**, up or down, regardless of load and direction of travel.
- F. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- G. Locate hall lanterns either above or beside hoistway entrance at a minimum of **72 inches (1829 mm)** above finished floor unless hall lanterns are built into entrance frames.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use, perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by authorities having jurisdiction.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, **adjust, and maintain**] elevator(s).
- B. Check operation of elevator with Owner's personnel present before date of Substantial Completion[**and again not more than one month before end of warranty period**]. Determine that operation systems and devices are functioning properly.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include **<Insert number>** months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours with response time of **[two]<Insert number>** hours or less.
 - 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of **[two]<Insert number>** hours or less.



14 - Conveying Equipment

END OF SECTION 14 26 00 00

SECTION 14 41 19 00 - STAIRWAY CHAIRLIFTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Inclined stairway chairlifts.

B. Related Requirements:

1. Section 144200 "Wheelchair Lifts" for inclined platform lifts that transport persons in wheelchairs along a stairway.

1.2 DEFINITIONS

- A. Definitions in ASME A18.1 apply to Work of this Section.**

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and finishes for lifts.
2. Include rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes, and accessories.

B. Shop Drawings: For each lift.

1. Include plans, elevations, sections, attachment details, and required clearances.
2. Indicate dimensions, weights, loads, and points of load to building structure.
3. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For surfaces and components with factory-applied color finishes.

1. Include Samples of integrally colored materials and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Metal Finish: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
2. Tubular Products and Running Trim: Manufacturer's standard-size unit, **6 inches (150 mm)** long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of lift.

- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Parts list with sources indicated.
 - b. Recommended parts inventory list.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one][two][five]<Insert number>**-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - 1. Maintenance Proximity: Not more than **[two]<Insert number>** hours' normal travel time from Installer's place of business to Project site.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Two][Three][Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Standard: Comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."

2.2 INCLINED STAIRWAY CHAIRLIFT

- A. Inclined Stairway Chairlifts: Preengineered, inclined, stairway lift system.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Acorn Stairlifts Inc.]
 - b. [Bruno Independent Living Aids, Inc.]
 - c. [Garaventa Lift]
 - d. [Harmar]
 - e. [Savaria]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Acorn Stairlifts Inc.]
 - b. [Bruno Independent Living Aids, Inc.]
 - c. [Garaventa Lift]
 - d. [Harmar]
 - e. [Savaria]
 - f. <Insert manufacturer's name>
- B. Rated Capacity: Minimum [250 lb (115 kg)][400 lb (180 kg)]<Insert value>.
- C. Rated Speed: [20 fpm (0.10 m/s)]<Insert value>.
- D. Electrical Characteristics:
1. Horsepower: [1/4][1/3][1/2][3/4]<Insert value>.
 2. AC Voltage: [115 V ac][208 V ac][230 V ac]<Insert value>, single phase, 60 Hz.
 3. DC Voltage: [24 V dc battery with 115 V ac, 60-Hz, single-phase charger]<Insert requirement>.
- E. Emergency Operation:
1. Battery Operation: Provide battery-operated drive with automatic charging system.
 2. Manual Lowering: Provide means to manually lower units in case of malfunction or power loss.
- F. Folding Units: When not in use, units are to be capable of manually folding up against wall to minimize projection into stairway.
- G. Support to Structure: Provide brackets to support vertical loads from floor or stair treads and to support lateral loads from walls. Fabricate brackets from steel plates, shapes, or bars.
- H. Accessories: Provide units with the following accessories:
1. Tubular-steel, manually operated safety arms designed to restrain and provide grab bar for occupant.
 2. Retractable seatbelt.
 3. Seat with back and two handgrips or arms.

2.3 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF STAIRWAY CHAIRLIFTS

- A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.
- B. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and route conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- C. Adjust stops for accurate stopping at each landing.
- D. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.
- E. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.
- B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service will include **[three][12]<Insert number>** months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies are to be manufacturer's

authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.
- B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.
- C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 14 41 19 00

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14 - Conveying Equipment

Task	Specification	Specification Description
14 41 19 00	14 42 00 00	Wheelchair Lifts



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SECTION 14 42 00 00 - WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. **[Vertical][Private-residence, vertical]** platform lifts.
2. Courtroom vertical platform lifts.
3. **[Inclined][Private-residence, inclined]** platform lifts.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry.
3. Section 064400 "Ornamental Woodwork" for runway-enclosure walls and doors.
4. **[Section 087100 "Door Hardware"]****[Section 087111 "Door Hardware (Descriptive Specification)"]** for runway-enclosure door hardware including monitored, electric door strikes if not included in lift work.
5. Section 099113 "Exterior Painting" for field painting of lift equipment.
6. Section 099123 "Interior Painting" for field painting of lift equipment.

1.2 DEFINITIONS

- A. Definitions in ASME A18.1 apply to Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and finishes for lifts.
2. Include rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes, and accessories.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
5. Product Data: For composite wood products, indicating compliance with requirements for formaldehyde emissions.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

- C. Shop Drawings: For each lift.
 - 1. Include plans, elevations, sections, attachment details, and required clearances.
 - 2. Indicate dimensions, weights, loads, and points of load to building structure.
 - 3. Include details of equipment assemblies, method of field assembly, components, and location and size of each field connection.
 - 4. Include diagrams for power, signal, and control wiring.
- D. Samples for Initial Selection: For surfaces and components with factory-applied color finishes.
 - 1. Include Samples of integrally colored materials and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Metal Finish: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
 - 2. Wood Finish: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
 - 3. Fiberglass Finish: Manufacturer's standard-size unit, not less than **3 inches (75 mm)** square.
 - 4. Tubular Products and Running Trim: Manufacturer's standard-size unit, **6 inches (150 mm)** long.
 - 5. Glass and Glazing: Units **12 inches (300 mm)** square.
 - 6. Hardware: Manufacturer's standard, exposed, door-operating device.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[manufacturer][vendor][and]** Installer.
- B. Product Certificates: For each type of lift.
 - 1. Include statement that runway, ramp or pit, dimensions as shown on Drawings, and electrical service as shown and specified are adequate for lift being provided.
- C. Evaluation Reports: For **[post-installed anchors][and][power-actuated fasteners]**, from ICC-ES.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Parts list with sources indicated.
 - b. Recommended parts inventory list.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard **[one][two][five]<Insert number>**-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for

agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
 - 1. Chain-of-Custody Qualification Data: For manufacturer and vendor.
- E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - 1. Maintenance Proximity: Not more than **[two]<Insert number>** hours' normal travel time from Installer's place of business to Project site.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Two][Three][Five]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in **[the USDOJ's "2010 ADA Standards for Accessible Design"]****[the ABA standards of the Federal agency having jurisdiction]****[and]****[ICC A117.1]<Insert requirement>**.
- B. Regulatory Requirements: Comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."
- C. Fire-Rated, Runway-Enclosure Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to **[NFPA 252][or][UL 10B]**.
 - 1. Temperature-Rise Limit: Provide doors that have a maximum transmitted temperature end point of not more than **450 deg F (250 deg C)** above ambient after 30 minutes of standard fire-test exposure.

2.2 VERTICAL PLATFORM LIFT

- A. Vertical Platform Lifts: Preengineered lift system[, **private residence**].
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ascension, Division of AGM Container Controls, Inc.]
 - b. [Bruno Independent Living Aids, Inc.]
 - c. [Butler Mobility Products]
 - d. [Florlift of New Jersey, Inc.]
 - e. [Garaventa Lift]
 - f. [Inclinator Company of America, Inc.]
 - g. [Lift-U]
 - h. [Liftavator, Inc]
 - i. [Savaria]
 - j. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ascension, Division of AGM Container Controls, Inc.]
 - b. [Bruno Independent Living Aids, Inc.]
 - c. [Butler Mobility Products]
 - d. [Florlift of New Jersey, Inc.]
 - e. [Garaventa Lift]
 - f. [Inclinator Company of America, Inc.]
 - g. [Lift-U]
 - h. [Liftavator, Inc]
 - i. [Savaria]
 - j. <Insert manufacturer's name>
- B. Number of Stops: [As indicated on Drawings][Two][Three]<Insert number>.
- C. Platform Size: [34 by 54 inches (864 by 1372 mm)][35 by 48 inches (889 by 1220 mm)][35 by 51 inches (889 by 1295 mm)][36 by 56 inches (914 by 1422 mm)][36 by 60 inches (914 by 1524 mm)]<Insert dimensions>.
- D. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; [end door with minimum 32-inch (815-mm)][and][side door with minimum 42-inch (1065-mm)]<Insert dimension> clear opening width.
- E. Rated Speed: [8 fpm (0.04 m/s)][10 fpm (0.05 m/s)][17 fpm (0.09 m/s)][20 fpm (0.10 m/s)][30 fpm (0.15 m/s)]<Insert value>.
- F. Power Supply: [Electric][Hydraulic].
1. Electrical Characteristics:
 - a. Horsepower: [1/2][1][2][3]<Insert value>.
 - b. Single-Phase AC Voltage: [115-V ac][230-V ac], single phase, 60 Hz.
 - c. Three-Phase AC Voltage: [208-V ac]<Insert value>, three phase, 60 Hz.

- d. DC Voltage: **[24-V dc battery with 115-V ac, 60-Hz, single-phase charger]<Insert requirement>**.
- G. Emergency Operation: Provide **[manual operation][and][battery power system][connection to indicated standby (emergency) power]** to raise or lower unit to a landing in case of malfunction or power loss.
- H. Attendant Operation: Provide attendant call device at each landing **[at locations shown]**.
- I. Self-Supporting Unit: Support vertical loads of unit only at base, with lateral support only at landing levels.
- J. **[Partial]**Runway Enclosure: Manufacturer's standard **[weather-resistant]** enclosure assembly.
1. Runway Enclosure:
 - a. Rectangular **[, hot-dip-galvanized, steel][steel]**-tube frame with flush **[galvanized-steel-sheet][steel-sheet]** panels.
 - b. Extruded-aluminum frame with flush **[galvanized-steel][aluminum]**-sheet panels.
 - c. Rectangular steel-tube frame with wood panels and trim.
 - d. Rectangular wood frame with wood panels and trim.
 - e. Rectangular steel-tube frame with fiberglass panels.
 2. Glazed Runway Enclosure: Rectangular, glazed extruded-aluminum frame with an acrylic dome roof.
 - a. Acrylic Glazing: 6.0 mm thick; **[clear][bronze tinted][color matching Architect's sample][color as selected by Architect from manufacturer's full range]<Insert color>**.
 - b. Glass Glazing: **[Float][tempered safety][and][laminated safety]** glass, 6.0 mm thick; **[clear][bronze tinted][color matching Architect's sample][color as selected by Architect from manufacturer's full range]<Insert color>**.
 3. Runway-Enclosure Doors:
 - a. Rectangular steel-tube frame with flush steel-sheet panels.
 - b. Rectangular wood frame with wood panels and trim.
 - c. Rectangular steel-tube frame with fiberglass panels.
 - d. Rectangular steel-tube frame glazed with 6.0-mm-thick, **[clear][bronze-tinted]<Insert color>** acrylic glazing and with **12-inch- (300-mm-)** high, steel kick panels.
 - e. Wide-stile aluminum entrance doors glazed with **[clear][bronze-tinted]<Insert color>** tempered safety glass, 6.0 mm thick.
 - f. Enclosure doors matching appearance of adjacent **[glass-supported]<Insert description>** railings, complying with Section 057300 "Decorative Metal Railings."
 4. Fire-Rated, Runway-Enclosure Door: Provide **[where shown][at upper landing][at lower landing]<Insert location>**.
 - a. Fire-Protection Rating: 1-1/2 hours.
 - b. Equip door with wired glass vision panel, delay-action door closer, dead latch, dummy trim door handle, and electric strike.
- K. Platform:
1. Steel sheet or galvanized-steel sheet with **[matte or primed finish suitable to accept flooring][manufacturer's standard black rubber flooring]<Insert requirement>**.
 2. Stainless-steel floor plate with **[checkered]<Insert pattern>** texture.

3. Aluminum floor plate with [nonskid][diamond-pattern]<Insert pattern> surface texture.
- L. Platform Low-Profile Carriage: Fabricate platform floor assembly to a total thickness not exceeding 1-1/2 inches (38 mm).
- M. Platform Enclosure and Door:
 1. Rectangular[, hot-dip-galvanized,] steel-tube frame with flush [galvanized-]steel-sheet panels.
 2. Extruded-aluminum frame with flush [galvanized-steel][aluminum]-sheet panels.
 3. Rectangular steel-tube frame with wood panels and trim.
 4. Rectangular steel-tube frame with fiberglass panels.
- N. Platform Top: Provide a non-load-bearing top, matching construction of enclosure walls. Permanently mark top to indicate that it cannot sustain a load.
- O. Ramp: [Fixed ramp matching platform to provide transition from floor to lift platform at bottom landing][Retractable ramp matching platform to provide transition from lower floor to lift platform. Ramp lowers to floor automatically when lifts reach lower landing and door opens. Ramp rises automatically when lift control is activated for lift to leave lower landing].
 1. Ramp Size: [End ramps a minimum of 32 inches (815 mm)][and][side ramps a minimum of 42 inches (1065 mm)] wide; length as required for slope.
 2. Ramp Slope: [As indicated][Maximum 1:12]<Insert slope>.
 3. Ramp Finish: [Finish ramps to match lift platform][As indicated on Drawings]<Insert requirement>.
- P. Accessories: Provide units with the following accessories:
 1. Fold-down seat with seatbelt.
 2. Forced Ventilation System: Minimum one air change per minute, [continuously operating][thermostatically controlled to activate at 90 deg F (32.2 deg C)], and with auxiliary power source to operate ventilation for one hour in case of power failure.
 3. Lighting system within lift enclosures as [indicated on Drawings][selected by Architect from manufacturer's available products].

2.3 COURTROOM VERTICAL PLATFORM LIFT

- A. Courtroom Vertical Platform Lift: Preengineered lift system.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Lift-U]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Lift-U]
 - b. <Insert manufacturer's name>

- B. Number of Stops: **[As indicated on Drawings][Two][Three]<Insert number>**.
- C. Platform Size: **[36 by 48 inches (914 by 1220 mm)][36 by 51 inches (914 by 1295 mm)][60 by 60 inches (1524 by 1524 mm)]<Insert dimensions>**.
- D. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; **[end door with minimum 32-inch (815-mm)][and][side door with minimum 42-inch (1065-mm)]<Insert dimension>** clear opening width.
- E. Rated Speed: **[8 fpm (0.04 m/s)][10 fpm (0.05 m/s)]<Insert value>**.
- F. Electrical Characteristics:
 - 1. Horsepower: **[1/2][1][2]<Insert value>**.
 - 2. Voltage: **[115-V ac]<Insert voltage>**, single phase, 60 Hz.
- G. Emergency Operation: Provide **[manual operation][and][battery power system][connection to indicated standby (emergency) power]** to raise or lower unit to a landing in case of malfunction or power loss.
- H. Attendant Operation: Provide attendant call device at each landing **[at locations shown]**.
- I. Self-Supporting Unit: Support vertical loads of unit only at base, with lateral support only at landing levels.
- J. Platform: Steel sheet or galvanized-steel sheet with **[matte or primed finish suitable to accept flooring][manufacturer's standard black rubber flooring]<Insert requirement>**.
- K. Sidewalls, Doors, and Guards: Platform-mounted sidewalls and platform-mounted guards according to ASME A18.1 and as follows:
 - 1. Sidewalls:
 - 2. Rectangular steel-tube frame with flush steel-sheet panels.
 - 3. Rectangular wood frame with wood panels and trim.
 - 4. Rectangular steel-tube frame with fiberglass panels.
- L. Ramp: **[Fixed ramp matching platform to provide transition from floor to lift platform at bottom landing][Retractable ramp matching platform to provide transition from lower floor to lift platform. Ramp lowers to floor automatically when lifts reach lower landing and door opens. Ramp rises automatically when lift control is activated for lift to leave lower landing]**.
 - 1. Ramp Size: **[End ramps a minimum of 32 inches (815 mm)][and][side ramps a minimum of 42 inches (1065 mm)]** wide; length as required for slope.
 - 2. Ramp Slope: **[As indicated][Maximum 1:12]<Insert slope>**.
 - 3. Ramp Finish: **[Finish ramps to match lift platform][As indicated on Drawings]<Insert requirement>**.

2.4 INCLINED PLATFORM LIFT

- A. Inclined Platform Lift: Preengineered lift system[, **private residence**].
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Butler Mobility Products]
- b. [Garaventa Lift]
- c. [Savaria]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Butler Mobility Products]
- b. [Garaventa Lift]
- c. [Savaria]
- d. <Insert manufacturer's name>

- B. Number of Stops: [As indicated on Drawings][Two][Three]<Insert number>.
- C. Platform Size: [29 by 33 inches (737 by 838 mm)][28 by 35 inches (711 by 889 mm)][30 by 35 inches (760 by 889 mm)][30 by 36 inches (760 by 914 mm)][31 by 39 inches (787 by 991 mm)][30 by 41 inches (760 by 1041 mm)][30 by 42 inches (760 by 1067 mm)][31 by 43 inches (787 by 1092 mm)][30 by 48 inches (760 by 1220 mm)]<Insert dimensions>.
- D. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; [end door with minimum 32-inch (815-mm)][and][side door with minimum 42-inch (1065-mm)]<Insert dimension> clear opening width.
- E. Rated Speed: [12 fpm (0.06 m/s)][15 fpm (0.08 m/s)][20 fpm (0.10 m/s)][30 fpm (0.15 m/s)]<Insert value>.
- F. Electrical Characteristics:
 - 1. Horsepower: [3/4][1][2][3]<Insert value>.
 - 2. AC Voltage: [115-V ac][208-V ac][230-V ac], single phase, 60 Hz.
 - 3. DC Voltage: [24-V dc battery with 115-V ac, 60-Hz, single-phase charger]<Insert requirement>.
- G. Emergency Operation: Provide [manual operation][and][battery power system][connection to indicated standby (emergency) power] to raise or lower units to a landing in case of malfunction or power loss.
- H. Attendant Operation: Provide attendant call device at each landing[at locations shown].
- I. Platform:
 - 1. Steel sheet or galvanized-steel sheet with [matte or primed finish suitable to accept flooring][manufacturer's standard black rubber flooring]<Insert requirement>.
 - 2. Stainless-steel floor plate with [checkered]<Insert pattern> texture.
 - 3. Aluminum floor plate with nonskid surface texture.
- J. Automatic Folding Platforms: When not in use, platforms shall automatically fold up against wall to minimize projection into stairway.
- K. Manual Folding Platforms: When not in use, platforms shall be capable of manually folding up against wall to minimize projection into stairway.

- L. Platform Guarding: Guard platform with **[passenger-restraining arms][enclosure]**.
 - 1. Passenger-Restraining Arms: **[Steel][Galvanized-steel][Stainless-steel]** tubing, **[manually][power]** operated.
 - 2. Platform Enclosure (Side Walls and Self-Closing Door):
 - a. Rectangular steel-tube frame with flush steel-sheet panels.
 - b. Enclosure walls and doors matching appearance of adjacent **[glass-supported]<Insert description>** railings, complying with Section 057300 "Decorative Metal Railings."
- M. Platform Guarding for Private Residences: Guard platform with **[automatically][manually]** actuated, retractable metal guard on lower access end of platform.
- N. Ramp: **[Fixed ramp matching platform to provide transition from floor to lift platform at bottom landing][Retractable ramp matching platform to provide transition from floor to lift platform. Ramp lowers to floor automatically when lifts reach landing and enclosure door opens. Ramp rises automatically when lift control is activated for lift to leave landing]**.
 - 1. Ramp Size: **[End ramps a minimum of 32 inches (815 mm)][and][side ramps a minimum of 42 inches (1065 mm)]** wide; length as required for slope.
 - 2. Ramp Slope: **[As indicated][Maximum 1:12]<Insert slope>**.
 - 3. Ramp Finish: **[Finish ramps to match lift platform][As indicated on Drawings]<Insert requirement>**.
- O. Support to Structure: Provide framing and brackets to support vertical loads from floor or stair treads and only lateral loads from walls. Fabricate framing and brackets from **[steel][stainless-steel]** rectangular tubing, plates, shapes, and bars.
- P. Guide Rails: Fabricate from **[steel][or][stainless-steel]** tubing.
- Q. Accessories: Provide units with the following accessories:
 - 1. Fold-down seat with seatbelt.
 - 2. Caution sign as required by ASME A18.1.

2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M.
- C. Steel Pipe: ASTM A53/A53M; standard weight (Schedule 40) unless otherwise indicated or required by loads.
- D. Steel Sheet: ASTM A1008/A1008M, cold-rolled commercial steel (CS) or ASTM A1011/A1011M hot-rolled, commercial steel (CS); as required for each use.
- E. Galvanized-Steel Sheet: ASTM A653/A653M, **G90 (Z275)** zinc coating.
- F. Galvanizing: Hot-dip galvanize items complying with the following:
 - 1. ASTM A123/A123M, for galvanizing steel and iron products.
 - 2. ASTM A153/A153M, for galvanizing steel and iron hardware.

- G. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.
1. Extruded Aluminum: **ASTM B221 (ASTM B221M)**.
 2. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**.
- H. Stainless-Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- I. Stainless-Steel Tubing: ASTM A554, Grade MT-304.
- J. Stainless-Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- K. Stainless-Steel Floor Plate: ASTM A793.
- L. Wood and Wood Panel Products Specified in Other Section: Comply with requirements in Section 064400 "Ornamental Woodwork."
- M. Wood and Wood Panel Products:
1. Wood: Clear, vertical-grain, straight, kiln-dried wood; of **[manufacturer's standard species.][one of the following species:][the following species:]**
 - a. **[Red oak]<Insert species>**.
 2. Fire-Retardant-Treated Wood: Clear, vertical-grain, straight, kiln-dried wood; fire-retardant treated to have flame-spread index of **[75][25]** or less and smoke-developed index of 450 or less according to ASTM E84; of **[manufacturer's standard species.][one of the following species:][the following species:]**
 - a. **[Red oak]<Insert species>**.
 3. Composite Wood Products: Products shall be made without urea formaldehyde.
 4. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 6. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - d. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
 7. Composite Wood Products: Products shall be made without urea formaldehyde.
 8. Wood Panels: Provide wood panels consisting of wood veneer and wood panel as follows:
 - a. Wood Veneer: Laminated to core with moisture-resistant adhesive.
 - 1) Species: **[Red oak]<Insert species>**.
 - 2) Cut: **[Plain sawn]<Insert cut>**.

- b. Particleboard: ANSI A208.1.
 - c. Medium-Density Fiberboard: ANSI A208.2.
 - d. Plywood: DOC PS 1.
 9. Fire-Retardant-Treated Wood Panels: Fire-retardant-treated, wood-veneered panels having flame-spread index of **[75][25]** or less and smoke-developed index of 450 or less according to ASTM E84.
 - a. Wood Veneer: Laminated to core with moisture-resistant adhesive.
 - 1) Species: **[Red oak]<Insert species>**.
 - 2) Cut: **[Plain sawn]<Insert cut>**.
 - b. Particleboard: ANSI A208.1.
 - c. Medium-Density Fiberboard: ANSI A208.2.
 - d. Plywood: DOC PS 1.
 - N. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light-stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and manufacturer's standard finish.
 - O. Glass Specified in Other Section: Comply with requirements in Section 088000 "Glazing."
 - P. Glass: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>** and complying with ASME A18.1.
 1. Safety Glass Products: Glass tested according to laminated-glass requirements of 16 CFR 1201, Category II, or ANSI Z97.1, Class A.
 2. Safety Glass Marking: Glass permanently marked with certification label of **[SGCC or another certification agency][or][manufacturer]** acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, safety glazing standard with which glass complies, and be located so as to be visible after installation.
 - Q. Acrylic Glazing: ASTM D4802, Category A-1 (cell-cast) or Category A-2 (continuous cast), Finish 1 (smooth or polished), clear or tinted as indicated.
 - R. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing structural members, guide rails, machines, and other lift components where installation of devices is specified in another Section.
 - S. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- 2.6 FASTENERS
- A. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on **[ICC-ES AC01][ICC-ES AC193][ICC-ES AC58][or][ICC-ES AC308]** as appropriate for the substrate.
 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: **[Alloy Group 1 (A1)][Alloy Group 2 (A4)]** stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

- B. Power-Actuated Fasteners: **[Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70][Do not use power-actuated fasteners].**

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 FINISHES

- A. **[Steel][and][Galvanized-Steel]** Factory Finish:
 - 1. Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat.
 - 2. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
- B. Stainless-Steel Finishes:
 - 1. Floor Plate Finish: **[Mill][Abrasive blasted]<Insert finish>.**
 - 2. Grab Rail Finish: **[As selected by Architect from manufacturer's full range][Directional satin finish No. 4]<Insert finish>.**
- C. Aluminum Finishes:
 - 1. Clear Anodic Finish: AAMA 611, **[AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm]** or thicker.
 - 2. Color Anodic Finish: AAMA 611, **[AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm]** or thicker.
 - a. Color: **[Light bronze][Medium bronze][Dark bronze][Black]<Insert color>.**
 - b. **[Match Architect's sample][As selected by Architect from full range of industry colors and color densities].**
 - 3. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - a. Color and Gloss: **[As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.**
- D. Wood Finish Specified in Other Section: **[As specified in Section 099300 "Staining and Transparent Finishing."]<Insert description>.**
- E. Wood Finish: **[Match Architect's sample][As selected by Architect from manufacturer's full range]**, as follows:

1. Type: **[Transparent finish][Transparent finish over stain]<Insert finish requirement>** over wood variety indicated.
- F. Fiberglass Color and Gloss: **[As indicated by manufacturer's designations][As selected by Architect from manufacturer's full range]<Insert color>**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.
- B. Minimum Headroom Clearance, ADA: Verify that installed lift will have a minimum headroom of **80 inches (2032 mm)** above any point on platform floor at any point of travel.
- C. Minimum Headroom Clearance: Verify that installed lift will have a minimum headroom of **[79 inches (2000 mm) at any point during travel][60 inches (1500 mm) at any point during travel and minimum of 79 inches (2000 mm) where the platform is positioned for boarding]**.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.
- B. Secure lifts to building construction as follows unless otherwise indicated:
 1. For concrete and solid masonry anchorage, use post-installed anchors.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 4. For steel-framed partitions, use hanger or lag bolts set into **[fire-retardant-treated]**wood backing between studs. Coordinate with stud installation to locate backing members.
 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.
- C. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and route conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Coordinate runway doors with platform travel and positioning, for accurate alignment and minimum clearance between platforms, runway doors, sills, and door frames.
- E. Position sills accurately and fill space under sills solidly with nonshrink, nonmetallic grout.
- F. Coordinate platform doors with platform travel and positioning.

- G. Adjust stops for accurate stopping[**and leveling**] at each landing, within required tolerances.
 - 1. Leveling Tolerance: **1/4 inch (6 mm)** up or down, regardless of load and direction of travel.
- H. Adjust retractable ramps to meet maximum allowable slope and change-in-elevation requirements, and to lie fully against landing surfaces.
- I. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.
- J. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.
- B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **[three][12]<Insert number>** months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.
- B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.
- C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 14 42 00 00



14 - Conveying Equipment

Task	Specification	Specification Description
14 42 13 00	14 42 00 00	Wheelchair Lifts
14 42 16 00	14 42 00 00	Wheelchair Lifts

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SECTION 14 91 82 00 - TRASH CHUTES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Waste chutes.
2. Waste doors.
3. Diverters.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal supporting framework at floor penetrations.
2. Section 076200 "Sheet Metal Flashing and Trim" for roof-vent flashing.
3. Section 077200 "Roof Accessories" for prefabricated roof curbs.
4. Section 211000 "Water-Based Fire-Suppression Systems" for fire-suppression water-service connections to automatic sprinklers in the chute.
5. Section 221116 "Domestic Water Piping" for water-service connections to chute-flushing or -sanitizing equipment.

1.2 DEFINITIONS

- A. Access Door: Door other than an intake or discharge door that penetrates the chase wall for service access to devices in the chase.
- B. Chase: The shaft that encloses a chute.
- C. Discharge Door: Door or hatch at the bottom of a chute, through which materials exit the chute.
- D. Intake Door: Door or hatch that penetrates the chase wall and chute, and through which materials are fed into the chute.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
1. **<Insert requirements>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chutes.
- B. Shop Drawings:

14 - Conveying Equipment



1. Include plans, elevations, sections, and mounting and attachment details.
2. Include dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include each type and location of intake, discharge, and access door.
4. Include diagrams for power, signal and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fire-rated door inspector.
 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Coordination Drawings: Plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Size and construction of chase enclosing each chute; locations for power, signal, and control wiring; and sprinkler-piping and water-service connections.
 2. Chute-discharge locations coordinated with compactor-intake or container locations.
- C. Product Certificates: For each type of chute.
- D. Field quality control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For chutes to include in operation and maintenance manuals.
 1. Include manufacturer's recycling plan guidelines.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 1. Maintenance Proximity: Not more than **[two]<Insert number>** hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80 section 5.2.3.1, plus the following:
 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 TRASH CHUTES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be**

incorporated into the Work include, but are not limited to, the following]:

1. [American Chute, LLC]
2. [Century Chute LLC.]
3. [Chute Source, LLC]
4. [Chutes International]
5. [Midland Chutes]
6. [U.S. Chutes; U.S.C. Group]
7. [Valiant Products, Inc.]
8. [Western Chutes; Buchanan Company, Inc.]
9. [Wilkinson Hi-Rise, LLC]
10. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [American Chute, LLC]
2. [Century Chute LLC.]
3. [Chute Source, LLC]
4. [Chutes International]
5. [Midland Chutes]
6. [U.S. Chutes; U.S.C. Group]
7. [Valiant Products, Inc.]
8. [Western Chutes; Buchanan Company, Inc.]
9. [Wilkinson Hi-Rise, LLC]
10. <Insert manufacturer's name>

- C. Source Limitations: Obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing and inspecting agency, for fire-protection ratings indicated.
1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 2. Intake Doors: Labeled, [1][1-1/2]-hour fire-resistance rated[with 30-minute temperature rise of 250 deg F (140 deg C)].
 3. Access Doors: Labeled, [1][1-1/2]-hour fire-resistance rated[with 30-minute temperature rise of 250 deg F (140 deg C)].
- C. Discharge-Door Assemblies: [Fire-resistive door construction] [Labeled, 1-hour fire-resistance rated] [Labeled, 1-1/2-hour fire-resistance rated] according to NFPA 252 or UL 10B requirements for fire-rated door assemblies.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Standard: Provide chutes complying with NFPA 82[unless otherwise indicated].

2.3 WASTE CHUTES

- A. Chute Metal: **[Aluminum-coated, cold-rolled, commercial steel sheet; ASTM A463/A463M, Type 1, with not less than T1-40 (T1M-120) coating][Type 430 stainless steel, ASTM A240/A240M][Type 304 stainless steel, ASTM A240/A240M]<Insert requirement>**.
1. Thickness: **[0.0625 inch (1.587 mm)][0.0750 inch (1.900 mm)]**.
- B. Chute Size: **[24-inch (610-mm) diameter][As indicated on Drawings]<Insert dimension(s)>**.
- C. External Reinforcing for Offsets: Additional thickness of **[0.11-inch- (1.7-mm-)]<Insert dimensions>** thick chute metal with bracing to structure.

2.4 WASTE DOORS

- A. Intake-Door Assemblies: ASTM A240/A240M, Type 304, stainless steel self-closing units with positive latch and latch handle, with stainless steel trim; constructed as required for performance requirements indicated; and with frame suitable for the enclosing chase construction.
1. Door Type: **[Hopper][Type as indicated on Drawings]<Insert description>**.
 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
 3. Finish: Manufacturer's standard satin or ASTM A480/A480M No. 3 directional polish.
 4. Lockset: **[T-handle-type][Lever-handle-type]<Insert requirement>** cylinder lock that releases latch with key that is removable only when cylinder is locked.
 - a. Lock Cylinder: Cylinders **[specified in Section 087100 "Door Hardware."][specified in Section 087111 "Door Hardware (Descriptive Specification)."]**[standard with manufacturer.]
 - b. Keying: For each chute, key cylinders **[alike][differently for each floor][to master key system]<Insert requirement>**.
 - c. Keys: **[Two][Three]<Insert number>** for each cylinder.
 5. Latchset: **[T-handle type that unlatches door][Lever-handle type that unlatches door][Foot-operated type that unlatches and opens door when foot pedal is depressed]<Insert requirement>**.
 6. Accessible Automatic Door Operating System: Manufacturer's standard system complying with applicable provisions of the cited accessibility standard.
 7. Mechanical Interlocks: Interlock system for system servicing, operated from discharge door to automatically lock intake doors.
 8. Electrical Interlocks: Interlock system that is energized by opening one intake door; remaining intake doors automatically lock when system is energized.
 9. Baffles: Rubber backdraft baffles at each intake.
- B. Discharge-Door Assemblies: Aluminum-coated steel; direct vertical-discharge type, inclined, and horizontally closing and latching; constructed as required for performance requirements indicated; and equipped with **[165 deg F (74 deg C)]<Insert temperature>** fusible links that cause doors to close in the event of fire.
- C. Detector System: Heat-**[and smoke-]**detecting interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature.
1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Access-Door Assemblies: Manufacturer's standard ASTM A240/A240M, Type 302/304, stainless steel

doors with trim; constructed as required for performance requirements indicated; with frame suitable for the enclosing chase construction; in satin or ASTM A480/A480M No. 3 directional polish finish; equipped with cylinder locks that release latch with keys that are removable only when cylinder is locked.

1. Lock Cylinder: Cylinders [specified in Section 087100 "Door Hardware."][specified in Section 087111 "Door Hardware (Descriptive Specification)."] [standard with manufacturer.]
2. Keying: Key access-door cylinders [alike][to master key system]<Insert requirement>.
3. Keys: [Two][Three]<Insert number> for each cylinder.

- E. Manual Control System: Control system with manual switches that lock chute doors during shutdown hours and service operations.

2.5 DIVERTERS

- A. Diverters: Manufacturer's standard motorized system for distributing materials from one chute into [two][three]<Insert number> containers in the discharge room as indicated on Drawings. Integrate diverter controls with controls at intake doors.
- B. Construction: Welded steel-plate housing with powered, internal steel blade(s) to deflect materials from chute into appropriate containers.
- C. Controls: Integrated, electronic master control unit in discharge room and electronic controls at each intake door, including self-diagnostic program for whole system.
- D. Motor Characteristics: Size sufficient to operate diverter blades without exceeding nameplate rating or service factor; complying with NEMA MG 1 and the following:
1. Horsepower: [Manufacturer's standard]<Insert value>.
 2. Volts: [115 V]<Insert requirement>.
 3. Phase: [Single phase]<Insert requirement>.
 4. Hertz: 60.
 5. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
- E. Recycling Containers: Industry standard, [90-gal. (340-L) containers for comingled recyclables][and][2-cu. yd. (1.5-cu. m) containers for newspaper]<Insert requirement> as recommended by diverter manufacturer for compatibility with diverter system.

2.6 ACCESSORIES

- A. Chute Fire Sprinklers: NFPA 13; manufacturer's standard, recessed, automatic, **NPS 1/2 (DN 13)** sprinklers; ready for piping connections.
- B. Flushing Spray Unit: **NPS 3/4 (DN 19)** spray-head unit located in chute above highest intake door, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- C. Sanitizing Unit: **NPS 3/4 (DN 19)** disinfecting and sanitizing spray-head unit located in chute above highest intake door, including **1-gal. (3.8-L)** tank and adjustable proportioning valve with bypass for manual control of sanitizing and flushing operation, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- D. Intake-Door Baffles: Rubber baffles, **1/8 inch (3 mm)** thick.

- E. Sound Dampening: Manufacturer's standard **[sound-deadening coating on exterior of chute][sound and vibration isolator pads at supporting frame at each floor penetration][and][sound-insulating wrap around exterior of chute and intake assemblies]**.

- F. **<Insert requirements>**.

2.7 FABRICATION

- A. Factory-assemble chutes to greatest extent practicable with nonleaking, continuously welded or lock-seamed joints without bolts, rivets, or clips projecting into chute interior. Include intake-door assemblies, metal supporting framing at each floor, and chute expansion joints between each support point.
- B. Offsets: Construct offsets where indicated on Drawings. Fabricate so that installed chute is without obstructions that might prevent materials from free falling within chute.
 - 1. Offsets below Intake Doors: Unless otherwise indicated, do not exceed a 15-degree maximum offset angle at any point, or place offset closer than **48 inches (1220 mm)** to nearest door above offset.
 - 2. Offset above Top Intake Door: Do not exceed a 45-degree maximum offset angle between the highest intake door and the upper termination of chute.
 - 3. Offsets at Floors: Complete offset between floors by returning chute to plumb before penetrating floors.
 - 4. External Reinforcing: Externally reinforce impact area of offsets located below top intake door. Install vibration isolators where braced to structure.
- C. Roof Vent: Fabricate vent unit as full-size extension of chute, open to the atmosphere. Extend vent to height above roofing surface as indicated on Drawings. Equip vent with full insect screening and metal explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- D. Chute Fire Sprinklers: Install internally within chute, recessed out of the chute area through which material travels, and according to NFPA 13. Locate fire sprinklers at or above the top intake door of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.
- E. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

PART 3 - EXECUTION

3.1 INSTALLATION OF WASTE CHUTES

- A. Install and test chutes before installing enclosing chase construction.
- B. Install chutes **[and diverters]** according to NFPA 82 and manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor chutes securely to supporting structure to withstand impacts and stresses. Install chute and components to maintain fire-resistive performance of chute and the enclosing chase construction.
- C. Install chutes plumb, without obstructions that might prevent materials from free falling within chutes.

- D. Anchor flanges of chute vents to roof curbs before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.

3.2 INSTALLATION OF WASTE DOORS

- A. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes.
 - 1. Coordinate installation of foot-pedal door operator with installation of door and the enclosing chase construction.
 - 2. Interconnect sanitizer control with door interlock system.
- B. Electrical Interlock System: Install according to applicable NECA 1 recommendations.

3.3 FIELD QUALITY CONTROL

- A. Test chute components after installation.
 - 1. Operate doors, locks, and interlock systems to demonstrate that hardware operates properly and smoothly and electrical wiring is connected correctly.
 - 2. Complete test operations before installing chase enclosures.
- B. Test heat- **[and smoke-]**sensing devices for proper operation.
- C. Inspections:
 - 1. Fire-rated door inspections: Inspect each fire-rated door according to NFPA 80, section 5.2
 - 2. Repair or remove and replace door installations where inspections indicate that they do not comply with specified requirements.
 - 3. Reinspect repaired or replaced doors to determine if replaced or repaired door installations comply with specified requirements.
 - 4. Prepare and submit separate inspection report for each fire-rated door indicating compliance with each item listed in **[NFPA 80][and][NFPA 101]**.
- D. Plumbing Access Doors: After construction of chase enclosure, verify that access doors have been correctly located and properly installed for their purpose.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced movement.
- B. Operate sanitizing unit through one complete cycle of chute use and cleanup, and replenish chemicals or cleaning fluids in unit containers.

3.5 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of testing and inspecting agencies.

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3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain each chute and related equipment.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

3.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **[three][six][nine][12]** months' full maintenance by skilled employees of chute Installer. Include **[monthly][quarterly]** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper chute **[and diverter]** operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

END OF SECTION 14 91 82 00

SECTION 149182 - TRASH CHUTES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Waste chutes.
2. Waste doors.
3. Diverters.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal supporting framework at floor penetrations.
2. Section 076200 "Sheet Metal Flashing and Trim" for roof-vent flashing.
3. Section 077200 "Roof Accessories" for prefabricated roof curbs.
4. Section 211000 "Water-Based Fire-Suppression Systems" for fire-suppression water-service connections to automatic sprinklers in the chute.
5. Section 221116 "Domestic Water Piping" for water-service connections to chute-flushing or -sanitizing equipment.

1.2 DEFINITIONS

- A. Access Door: Door other than an intake or discharge door that penetrates the chase wall for service access to devices in the chase.
- B. Chase: The shaft that encloses a chute.
- C. Discharge Door: Door or hatch at the bottom of a chute, through which materials exit the chute.
- D. Intake Door: Door or hatch that penetrates the chase wall and chute, and through which materials are fed into the chute.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]<Insert location>**.
1. **<Insert requirements>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chutes.
- B. Shop Drawings:

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1. Include plans, elevations, sections, and mounting and attachment details.
2. Include dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include each type and location of intake, discharge, and access door.
4. Include diagrams for power, signal and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fire-rated door inspector.
 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Coordination Drawings: Plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Size and construction of chase enclosing each chute; locations for power, signal, and control wiring; and sprinkler-piping and water-service connections.
 2. Chute-discharge locations coordinated with compactor-intake or container locations.
- C. Product Certificates: For each type of chute.
- D. Field quality control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For chutes to include in operation and maintenance manuals.
 1. Include manufacturer's recycling plan guidelines.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 1. Maintenance Proximity: Not more than **[two]<Insert number>** hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80 section 5.2.3.1, plus the following:
 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 TRASH CHUTES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be**

incorporated into the Work include, but are not limited to, the following]:

1. [American Chute, LLC]
2. [Century Chute LLC.]
3. [Chute Source, LLC]
4. [Chutes International]
5. [Midland Chutes]
6. [U.S. Chutes; U.S.C. Group]
7. [Valiant Products, Inc.]
8. [Western Chutes; Buchanan Company, Inc.]
9. [Wilkinson Hi-Rise, LLC]
10. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [American Chute, LLC]
2. [Century Chute LLC.]
3. [Chute Source, LLC]
4. [Chutes International]
5. [Midland Chutes]
6. [U.S. Chutes; U.S.C. Group]
7. [Valiant Products, Inc.]
8. [Western Chutes; Buchanan Company, Inc.]
9. [Wilkinson Hi-Rise, LLC]
10. <Insert manufacturer's name>

- C. Source Limitations: Obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing and inspecting agency, for fire-protection ratings indicated.
1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 2. Intake Doors: Labeled, [1][1-1/2]-hour fire-resistance rated[with 30-minute temperature rise of 250 deg F (140 deg C)].
 3. Access Doors: Labeled, [1][1-1/2]-hour fire-resistance rated[with 30-minute temperature rise of 250 deg F (140 deg C)].
- C. Discharge-Door Assemblies: [Fire-resistive door construction] [Labeled, 1-hour fire-resistance rated] [Labeled, 1-1/2-hour fire-resistance rated] according to NFPA 252 or UL 10B requirements for fire-rated door assemblies.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Standard: Provide chutes complying with NFPA 82[unless otherwise indicated].

2.3 WASTE CHUTES

- A. Chute Metal: **[Aluminum-coated, cold-rolled, commercial steel sheet; ASTM A463/A463M, Type 1, with not less than T1-40 (T1M-120) coating][Type 430 stainless steel, ASTM A240/A240M][Type 304 stainless steel, ASTM A240/A240M]<Insert requirement>**.
1. Thickness: **[0.0625 inch (1.587 mm)][0.0750 inch (1.900 mm)]**.
- B. Chute Size: **[24-inch (610-mm) diameter][As indicated on Drawings]<Insert dimension(s)>**.
- C. External Reinforcing for Offsets: Additional thickness of **[0.11-inch- (1.7-mm-)]<Insert dimensions>** thick chute metal with bracing to structure.

2.4 WASTE DOORS

- A. Intake-Door Assemblies: ASTM A240/A240M, Type 304, stainless steel self-closing units with positive latch and latch handle, with stainless steel trim; constructed as required for performance requirements indicated; and with frame suitable for the enclosing chase construction.
1. Door Type: **[Hopper][Type as indicated on Drawings]<Insert description>**.
 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
 3. Finish: Manufacturer's standard satin or ASTM A480/A480M No. 3 directional polish.
 4. Lockset: **[T-handle-type][Lever-handle-type]<Insert requirement>** cylinder lock that releases latch with key that is removable only when cylinder is locked.
 - a. Lock Cylinder: Cylinders **[specified in Section 087100 "Door Hardware."][specified in Section 087111 "Door Hardware (Descriptive Specification)."]**[standard with manufacturer.]
 - b. Keying: For each chute, key cylinders **[alike][differently for each floor][to master key system]<Insert requirement>**.
 - c. Keys: **[Two][Three]<Insert number>** for each cylinder.
 5. Latchset: **[T-handle type that unlatches door][Lever-handle type that unlatches door][Foot-operated type that unlatches and opens door when foot pedal is depressed]<Insert requirement>**.
 6. Accessible Automatic Door Operating System: Manufacturer's standard system complying with applicable provisions of the cited accessibility standard.
 7. Mechanical Interlocks: Interlock system for system servicing, operated from discharge door to automatically lock intake doors.
 8. Electrical Interlocks: Interlock system that is energized by opening one intake door; remaining intake doors automatically lock when system is energized.
 9. Baffles: Rubber backdraft baffles at each intake.
- B. Discharge-Door Assemblies: Aluminum-coated steel; direct vertical-discharge type, inclined, and horizontally closing and latching; constructed as required for performance requirements indicated; and equipped with **[165 deg F (74 deg C)]<Insert temperature>** fusible links that cause doors to close in the event of fire.
- C. Detector System: Heat-**[and smoke-]**detecting interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature.
1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Access-Door Assemblies: Manufacturer's standard ASTM A240/A240M, Type 302/304, stainless steel

doors with trim; constructed as required for performance requirements indicated; with frame suitable for the enclosing chase construction; in satin or ASTM A480/A480M No. 3 directional polish finish; equipped with cylinder locks that release latch with keys that are removable only when cylinder is locked.

1. Lock Cylinder: Cylinders [specified in Section 087100 "Door Hardware."][specified in Section 087111 "Door Hardware (Descriptive Specification)."] [standard with manufacturer.]
2. Keying: Key access-door cylinders [alike][to master key system]<Insert requirement>.
3. Keys: [Two][Three]<Insert number> for each cylinder.

- E. Manual Control System: Control system with manual switches that lock chute doors during shutdown hours and service operations.

2.5 DIVERTERS

- A. Diverters: Manufacturer's standard motorized system for distributing materials from one chute into [two][three]<Insert number> containers in the discharge room as indicated on Drawings. Integrate diverter controls with controls at intake doors.
- B. Construction: Welded steel-plate housing with powered, internal steel blade(s) to deflect materials from chute into appropriate containers.
- C. Controls: Integrated, electronic master control unit in discharge room and electronic controls at each intake door, including self-diagnostic program for whole system.
- D. Motor Characteristics: Size sufficient to operate diverter blades without exceeding nameplate rating or service factor; complying with NEMA MG 1 and the following:
1. Horsepower: [Manufacturer's standard]<Insert value>.
 2. Volts: [115 V]<Insert requirement>.
 3. Phase: [Single phase]<Insert requirement>.
 4. Hertz: 60.
 5. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
- E. Recycling Containers: Industry standard, [90-gal. (340-L) containers for comingled recyclables][and][2-cu. yd. (1.5-cu. m) containers for newspaper]<Insert requirement> as recommended by diverter manufacturer for compatibility with diverter system.

2.6 ACCESSORIES

- A. Chute Fire Sprinklers: NFPA 13; manufacturer's standard, recessed, automatic, **NPS 1/2 (DN 13)** sprinklers; ready for piping connections.
- B. Flushing Spray Unit: **NPS 3/4 (DN 19)** spray-head unit located in chute above highest intake door, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- C. Sanitizing Unit: **NPS 3/4 (DN 19)** disinfecting and sanitizing spray-head unit located in chute above highest intake door, including **1-gal. (3.8-L)** tank and adjustable proportioning valve with bypass for manual control of sanitizing and flushing operation, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- D. Intake-Door Baffles: Rubber baffles, **1/8 inch (3 mm)** thick.

- E. Sound Dampening: Manufacturer's standard **[sound-deadening coating on exterior of chute][sound and vibration isolator pads at supporting frame at each floor penetration][and][sound-insulating wrap around exterior of chute and intake assemblies]**.

- F. **<Insert requirements>**.

2.7 FABRICATION

- A. Factory-assemble chutes to greatest extent practicable with nonleaking, continuously welded or lock-seamed joints without bolts, rivets, or clips projecting into chute interior. Include intake-door assemblies, metal supporting framing at each floor, and chute expansion joints between each support point.
- B. Offsets: Construct offsets where indicated on Drawings. Fabricate so that installed chute is without obstructions that might prevent materials from free falling within chute.
 - 1. Offsets below Intake Doors: Unless otherwise indicated, do not exceed a 15-degree maximum offset angle at any point, or place offset closer than **48 inches (1220 mm)** to nearest door above offset.
 - 2. Offset above Top Intake Door: Do not exceed a 45-degree maximum offset angle between the highest intake door and the upper termination of chute.
 - 3. Offsets at Floors: Complete offset between floors by returning chute to plumb before penetrating floors.
 - 4. External Reinforcing: Externally reinforce impact area of offsets located below top intake door. Install vibration isolators where braced to structure.
- C. Roof Vent: Fabricate vent unit as full-size extension of chute, open to the atmosphere. Extend vent to height above roofing surface as indicated on Drawings. Equip vent with full insect screening and metal explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- D. Chute Fire Sprinklers: Install internally within chute, recessed out of the chute area through which material travels, and according to NFPA 13. Locate fire sprinklers at or above the top intake door of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.
- E. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

PART 3 - EXECUTION

3.1 INSTALLATION OF WASTE CHUTES

- A. Install and test chutes before installing enclosing chase construction.
- B. Install chutes **[and diverters]** according to NFPA 82 and manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor chutes securely to supporting structure to withstand impacts and stresses. Install chute and components to maintain fire-resistive performance of chute and the enclosing chase construction.
- C. Install chutes plumb, without obstructions that might prevent materials from free falling within chutes.

- D. Anchor flanges of chute vents to roof curbs before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.

3.2 INSTALLATION OF WASTE DOORS

- A. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes.
 - 1. Coordinate installation of foot-pedal door operator with installation of door and the enclosing chase construction.
 - 2. Interconnect sanitizer control with door interlock system.
- B. Electrical Interlock System: Install according to applicable NECA 1 recommendations.

3.3 FIELD QUALITY CONTROL

- A. Test chute components after installation.
 - 1. Operate doors, locks, and interlock systems to demonstrate that hardware operates properly and smoothly and electrical wiring is connected correctly.
 - 2. Complete test operations before installing chase enclosures.
- B. Test heat- **[and smoke-]**sensing devices for proper operation.
- C. Inspections:
 - 1. Fire-rated door inspections: Inspect each fire-rated door according to NFPA 80, section 5.2
 - 2. Repair or remove and replace door installations where inspections indicate that they do not comply with specified requirements.
 - 3. Reinspect repaired or replaced doors to determine if replaced or repaired door installations comply with specified requirements.
 - 4. Prepare and submit separate inspection report for each fire-rated door indicating compliance with each item listed in **[NFPA 80][and][NFPA 101]**.
- D. Plumbing Access Doors: After construction of chase enclosure, verify that access doors have been correctly located and properly installed for their purpose.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced movement.
- B. Operate sanitizing unit through one complete cycle of chute use and cleanup, and replenish chemicals or cleaning fluids in unit containers.

3.5 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of testing and inspecting agencies.

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3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain each chute and related equipment.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

3.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **[three][six][nine][12]** months' full maintenance by skilled employees of chute Installer. Include **[monthly][quarterly]** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper chute **[and diverter]** operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

END OF SECTION 149182



Task	Specification	Specification Description
21 01 10 91	01 91 13 00a	Commissioning Of Fire Suppression



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SECTION 21 05 00 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section includes:

1. Motors.
2. Sleeves without waterstop.
3. Sleeves with waterstop.
4. Stack-sleeve fittings.
5. Sleeve-seal systems.
6. Grout.
7. Silicone sealants.
8. Escutcheons.

1.2 DEFINITIONS

- A. Existing Piping to Remain:** Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product, excluding motors which are included in Part 1 of the fire-suppression equipment Sections.
 - a. Include construction details, material descriptions, and dimensions of components.
 - b. Include operating characteristics and furnished accessories.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.**

1.5 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:**
1. Motor controllers.



2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motor Requirements, General:

1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
3. Comply with NEMA MG 1 unless otherwise indicated.

B. Motor Characteristics:

1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of **3300 ft. (1000 m)** above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Polyphase Motors:

1. Description: NEMA MG 1, Design B, medium induction motor.
2. Efficiency: Premium Efficient, as defined in NEMA MG 1.
3. Service Factor: 1.15.
4. Multispeed Motors: Variable torque.
 - a. For motors with 2:1 speed ratio, consequent pole, single winding.
 - b. For motors with other than 2:1 speed ratio, separate winding for each speed.
5. Multispeed Motors, Multiple Winding: Separate winding for each speed.
6. Rotor: Random-wound, squirrel cage.
7. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
8. Temperature Rise: Match insulation rating.
9. Insulation: **[Class F]<Insert class>**.
10. Code Letter Designation:
 - a. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - b. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
11. Enclosure Material: Cast iron for motor frame sizes **[324T]<Insert number>** and larger; rolled steel for motor frame sizes smaller than **[324T]<Insert number>**.

D. Additional Requirements for Polyphase Motors:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box,

- suited to control method.
2. Motors Used with Variable-Frequency Controllers: [**Ratings, characteristics, and features coordinated with and approved by controller manufacturer.**]
 - a. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time-rise pulses produced by pulse-width-modulated inverters.
 - b. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - c. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - d. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- E. Single-Phase Motors:
1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
 - a. Permanent-split capacitor.
 - b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 4. Motors 1/20 HP and Smaller: Shaded-pole type.
 5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.
- F. Electronically Commutated Motors:
1. Microprocessor-Based Electronic Control Module: Converts [120 V][or][240 V] single-phase AC power to three-phase DC power to operate the brushless DC motor.
 2. Three-phase power motor module with permanent magnet rotor.
 3. [Circuit board][or][digital speed controller/LED display].
 4. Building Automation System Interface: Via [AC voltage signal][DC voltage signal][or][Digital Serial Interface (DSI)].
- 2.2 SLEEVES AND SLEEVE SEALS
- A. Sleeves without Waterstop:
1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
 2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
 3. Steel Sheet Sleeves: ASTM A653/A653M, **24 gauge (0.6 mm)** minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.
 4. PVC Pipe Sleeves: ASTM D1785, Schedule 40.
 5. Molded-PVC Sleeves: With nailing flange.
 6. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange.
- B. Sleeves with Waterstop:



1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Products & Systems, LLC]**
 - b. **[CALPICO, Inc.]**
 - c. **[GPT; a division of EnPRO Industries]**
 - d. **[Metraflex Company (The)]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Products & Systems, LLC]**
 - b. **[CALPICO, Inc.]**
 - c. **[GPT; a division of EnPRO Industries]**
 - d. **[Metraflex Company (The)]**
 - e. **<Insert manufacturer's name>**
3. Description: Manufactured **[PVC/HDPE][steel][stainless steel][galvanized steel]**, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Stack-Sleeve Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Wade; a subsidiary of McWane Inc.]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Wade; a subsidiary of McWane Inc.]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
3. Description: Manufactured, **[Dura-coated or Duco-coated][galvanized]** cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with setscrews.

D. Sleeve-Seal Systems:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Advance Products & Systems, LLC]
 - b. [CALPICO, Inc.]
 - c. [GPT; a division of EnPRO Industries]
 - d. [Metraflex Company (The)]
 - e. [Proco Products, Inc]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Advance Products & Systems, LLC]
 - b. [CALPICO, Inc.]
 - c. [GPT; a division of EnPRO Industries]
 - d. [Metraflex Company (The)]
 - e. [Proco Products, Inc]
 - f. <Insert manufacturer's name>
3. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
- a. Hydrostatic Seal: **20 psig (137 kPa)** minimum.
 - b. Sealing Elements: [EPDM-rubber][High-temperature-silicone][Nitrile (Buna-N)] interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
 - c. Pressure Plates: [Carbon steel][Composite plastic][Stainless steel][Stainless steel, Type 316].
 - d. Connecting Bolts and Nuts: [Carbon steel, with ASTM B633 coating][Stainless steel][Stainless steel, Type 316,] of length required to secure pressure plates to sealing elements.
- E. Grout:
1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
 2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 3. Design Mix: **5000 psi (34.5 MPa)**, 28-day compressive strength.
 4. Packaging: Premixed and factory packaged.
- F. Silicone Sealants:
1. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [GE Construction Sealants; Momentive Performance Materials Inc.]
 - 2) [ITW Polymers Sealants North America]
 - 3) [Polymeric Systems, Inc.; PPG Industries, Inc.]
 - 4) [Sherwin-Williams Company (The)]



- 5) [Sika Corporation]
 - 6) [The Dow Chemical Company]
 - 7) [Tremco Incorporated]
 - 8) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [GE Construction Sealants; Momentive Performance Materials Inc.]
 - 2) [ITW Polymers Sealants North America]
 - 3) [Polymeric Systems, Inc.; PPG Industries, Inc.]
 - 4) [Sherwin-Williams Company (The)]
 - 5) [Sika Corporation]
 - 6) [The Dow Chemical Company]
 - 7) [Tremco Incorporated]
 - 8) <Insert manufacturer's name>
- c. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.
2. Silicone Sealant, S, P, T, NT: Single-component, [25][100/50], pourable, [plus 25 percent and minus 25 percent][plus 100 percent and minus 50 percent] movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- 1) [Pecora Corporation]
 - 2) [Sika Corporation]
 - 3) [The Dow Chemical Company]
 - 4) [Tremco Incorporated]
 - 5) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [Pecora Corporation]
 - 2) [Sika Corporation]
 - 3) [The Dow Chemical Company]
 - 4) [Tremco Incorporated]
 - 5) <Insert manufacturer's name>
- c. Standard: ASTM C920, Type S, Grade P, [Class 25][Class 100/50], Uses T and NT.
3. Silicone Foam Sealant: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Smooth-On]
 - 2) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Smooth-On]
 - 2) <Insert manufacturer's name>
4. Sealant shall have a VOC content of [250]<Insert value> g/L or less.
 - a. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - b. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - c. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - d. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - e. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.3 ESCUTCHEONS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [BrassCraft Manufacturing Co.; a Masco company]
 2. [Dearborn Brass]
 3. [Jones Stephens Corp.]
 4. [Keeney Manufacturing Company (The)]
 5. [Mid-America Fittings, LLC; A Midland Industries Company]
 6. [ProFlo; a Ferguson Enterprises, Inc. brand]
 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [BrassCraft Manufacturing Co.; a Masco company]
 2. [Dearborn Brass]
 3. [Jones Stephens Corp.]
 4. [Keeney Manufacturing Company (The)]
 5. [Mid-America Fittings, LLC; A Midland Industries Company]
 6. [ProFlo; a Ferguson Enterprises, Inc. brand]
 7. <Insert manufacturer's name>

C. Escutcheon Types:

1. One-Piece, Steel Type: With **[polished, chrome-plated][polished brass]** finish and setscrew fastener.
2. One-Piece, Stainless Steel Type: With polished stainless steel finish.
3. One-Piece, Cast-Brass Type: With **[polished, chrome-plated][polished brass]** finish and setscrew fastener.
4. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped **[steel][brass]** with polished, chrome-plated finish and spring-clip fasteners.
5. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
6. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; **[concealed][and][exposed-rivet]** hinge; and spring-clip fasteners.

D. Floor Plates:

1. Split Floor Plates: Steel with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE LOOPS AND SWING CONNECTIONS

- A. Install pipe loops and offsets in accordance with NFPA 13 requirements for expansion and contraction compensation.

3.2 INSTALLATION OF SLEEVES, GENERAL

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide **[1-inch (25-mm)][2-inch (50-mm)]<Insert dimension>** annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **[2 inches (50 mm)]<Insert dimension>** above finished floor level.
 3. Using **[grout][or][silicone sealant]**, seal space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire-resistance of floor/slab/wall.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.3 INSTALLATION OF SLEEVES WITH WATERSTOP

- A. Install sleeve with waterstop as new walls and slabs are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange centered across width centered in concrete slab or wall.
- C. Secure nailing flanges to wooden concrete forms.
- D. Using **[grout][or][silicone sealant]**, seal space around outside of sleeves.

3.4 INSTALLATION OF STACK-SLEEVE FITTINGS

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 1. Install fittings that are large enough to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 3. Install section of cast-iron soil pipe to extend sleeve to **3 inches (75 mm)** above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.
- B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- or smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF SLEEVE-SEAL SYSTEMS

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.6 INSTALLATION OF ESCUTCHEONS

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.7 FIELD QUALITY CONTROL

- A. Sleeves and Sleeve Seals:
 - 1. Perform the following tests and inspections:
 - a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
 - b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
 - 2. Prepare test and inspection reports.
- B. Escutcheons:
 - 1. Using new materials, replace broken and damaged escutcheons and floor plates.

3.8 SLEEVES APPLICATION

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above and below Grade:
 - a. Sleeves with waterstops.
 - 1) Select sleeve size to allow for **[1-inch (25-mm)]<Insert dimension>** annular clear space between piping and sleeve for installing sleeve-seal system.
 - 2. Concrete Slabs-on-Grade:
 - a. Sleeves with waterstops.
 - 1) Select sleeve size to allow for **[1-inch (25-mm)]<Insert dimension>** annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs above Grade:
 - a. **[Sleeves with waterstops][or][stack-sleeve fittings]**.
 - 4. Interior Walls and Partitions:
 - a. Sleeves without waterstops.

3.9 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Chrome-Plated Piping: One piece[, **steel**][, **cast brass**][**or split plate steel**] with polished, chrome-plated finish.
3. Insulated Piping:
 - a. One piece, steel with [**polished, chrome-plated**][**polished brass**] finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with [**polished, chrome-plated**][**polished brass**] finish.
 - d. One piece, stamped steel [**or split plate, stamped steel with concealed hinge**][**or split plate, stamped steel with exposed-rivet hinge**] with polished, chrome-plated finish.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces:
 - a. One piece, steel with [**polished, chrome-plated**][**polished brass**] finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with [**polished, chrome-plated**][**polished brass**] finish.
 - d. One piece, stamped steel [**or split plate, stamped steel with concealed hinge**][**or split plate, stamped steel with exposed-rivet hinge**] with polished, chrome-plated finish.
5. Bare Piping at Ceiling Penetrations in Finished Spaces:
 - a. One piece, steel with [**polished, chrome-plated**][**polished brass**] finish.
 - b. One piece, stainless steel with polished stainless steel finish.
 - c. One piece, cast brass with [**polished, chrome-plated**][**polished brass**] finish.
 - d. One piece, stamped steel [**or split plate, stamped steel with concealed hinge**][**or split plate, stamped steel with exposed-rivet hinge**] with polished, chrome-plated finish.
6. Bare Piping in Unfinished Service Spaces:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, cast brass with [**polished, chrome-plated**][**rough-brass**] finish.
 - c. One piece, stamped steel [**or split plate, stamped steel with concealed hinge**][**or split plate, stamped steel with exposed-rivet hinge**] with polished, chrome-plated finish.
7. Bare Piping in Equipment Rooms:
 - a. One piece, steel with polished, chrome-plated finish.
 - b. One piece, cast brass with [**polished, chrome-plated**][**rough-brass**] finish.
 - c. One piece, stamped steel [**or split plate, stamped steel with concealed hinge**][**or split plate, stamped steel with exposed-rivet hinge**] with polished, chrome-plated finish.

B. Escutcheons for Existing Piping to Remain:

1. Chrome-Plated Piping: Split plate, stamped steel with [**concealed**][**or**][**exposed-rivet**] hinge with polished, chrome-plated finish.
2. Insulated Piping: Split plate, stamped steel with [**concealed**][**or**][**exposed-rivet**] hinge with polished, chrome-plated finish.
3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split plate, stamped steel with [**concealed**][**or**][**exposed-rivet**] hinge with polished, chrome-plated finish.
4. Bare Piping at Ceiling Penetrations in Finished Spaces: Split plate, stamped steel with [**concealed**][**or**][**exposed-rivet**] hinge with polished, chrome-plated finish.
5. Bare Piping in Unfinished Service Spaces: Split plate, stamped steel with



-
- [concealed][or][exposed-rivet] hinge with polished, chrome-plated finish.
6. Bare Piping in Equipment Rooms: Split plate, stamped steel with [concealed][or][exposed-rivet] hinge with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
1. New Piping and Relocated Existing Piping: One piece, floor plate.
 2. Existing Piping: Split floor plate.

END OF SECTION 21 05 00 00



Task	Specification	Specification Description
21 05 00 00	21 05 33 00	Heat Tracing for Fire-Suppression Piping



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SECTION 21 05 23 00 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Two-piece ball valves with indicators.
2. Bronze butterfly valves with indicators.
3. Iron butterfly valves with indicators.
4. Check valves.
5. Bronze OS&Y gate valves.
6. Iron OS&Y gate valves.
7. NRS gate valves.
8. Indicator posts.
9. Trim and drain valves.

1.2 DEFINITIONS

- A. NRS: Nonrising stem.
- B. OS&Y: Outside screw and yoke.
- C. SBR: Styrene-butadiene rubber.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
 2. Protect threads, flange faces, and weld ends.
 3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
1. Maintain valve end protection.
 2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
- D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:
 - 1. Fire Main Equipment: HAMV - Main Level.
 - a. Indicator Posts, Gate Valve: HCBZ - Level 1.
 - b. Ball Valves, System Control: HLUG - Level 3.
 - c. Butterfly Valves: HLXS - Level 3.
 - d. Check Valves: HMER - Level 3.
 - e. Gate Valves: HMRZ - Level 3.
 - 2. Sprinkler System and Water Spray System Devices: VDGT - Main Level.
 - a. Valves, Trim and Drain: VQGU - Level 1.
- B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
 - 1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves.
 - 1) Gate valves.
 - 2) Check valves.
 - 3) Miscellaneous valves.
- C. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B31.9 for building services piping valves.
- D. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- E. NFPA Compliance for Valves:
 - 1. Comply with NFPA 13, NFPA 14, NFPA 20, and NFPA 24.
- F. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher, as required by system pressures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves **NPS 2 (DN 50)** and smaller.

2.3 TWO-PIECE BALL VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
2. **[NIBCO INC.]**
3. **[Victaulic Company]**
4. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
2. **[NIBCO INC.]**
3. **[Victaulic Company]**
4. **<Insert manufacturer's name>**

C. Description:

1. UL 1091, except with ball instead of disc and FM Global approved for indicating valves (butterfly or ball type), Class Number 1112.
2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
3. Body Design: Two piece.
4. Body Material: Forged brass or bronze.
5. Port Size: Full or standard.
6. Seats: PTFE.
7. Stem: Bronze or stainless steel.
8. Ball: Chrome-plated brass.
9. Actuator: Worm gear
10. Supervisory Switch: Internal or external.
11. End Connections for Valves **NPS 1 (DN 25)** through **NPS 2 (DN 50)**: Threaded ends.
12. End Connections for Valves **NPS 2-1/2 (DN 65)**: Grooved ends.

2.4 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[ALEUM USA]**
2. **[Globe Fire Sprinkler Corporation]**
3. **[Milwaukee Valve Company]**
4. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[ALEUM USA]**
2. **[Globe Fire Sprinkler Corporation]**
3. **[Milwaukee Valve Company]**
4. **<Insert manufacturer's name>**

C. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 1112.
2. Minimum: Pressure rating: **175 psig (1200 kPa)**.
3. Body Material: Bronze.
4. Seat Material: EPDM.
5. Stem Material: Bronze or stainless steel.
6. Disc: **[Bronze][Stainless steel][with EPDM coating]**.
7. Actuator: Worm gear.
8. Supervisory Switch: Internal or external.
9. Ends Connections for Valves **NPS 1 (DN 25)** through **NPS 2 (DN 50)**: Threaded ends.
10. Ends Connections for Valves **NPS 2-1/2 (DN 65)**: Grooved ends.

2.5 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[ALEUM USA]**
2. **[Anvil; an ASC Engineered Solution]**
3. **[Globe Fire Sprinkler Corporation]**
4. **[Kennedy Valve Company; a division of McWane, Inc.]**
5. **[NIBCO INC.]**
6. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
7. **[Victaulic Company]**
8. **[Zurn Industries, LLC]**
9. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[ALEUM USA]**
2. **[Anvil; an ASC Engineered Solution]**
3. **[Globe Fire Sprinkler Corporation]**
4. **[Kennedy Valve Company; a division of McWane, Inc.]**
5. **[NIBCO INC.]**
6. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
7. **[Victaulic Company]**
8. **[Zurn Industries, LLC]**
9. **<Insert manufacturer's name>**

C. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
3. Body Material: Cast or ductile iron[**with nylon, EPDM, epoxy, or polyamide coating**].
4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron, [**nickel plated**][**and EPDM or SBR coated**].
7. Actuator: Worm gear.
8. Supervisory Switch: Internal or external.
9. Body Design: [**Lug or wafer**][**Grooved-end connections**].

2.6 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

1. [**ALEUM USA**]
2. [**Ames Fire & Waterworks; A Watts Water Technologies Company**]
3. [**Anvil; an ASC Engineered Solution**]
4. [**FEBCO; A WATTS Brand**]
5. [**Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International**]
6. [**Globe Fire Sprinkler Corporation**]
7. [**Kennedy Valve Company; a division of McWane, Inc.**]
8. [**Matco-Norca**]
9. [**Mueller Co. LLC; Mueller Water Products, Inc.**]
10. [**NIBCO INC.**]
11. [**Reliable Automatic Sprinkler Co., Inc. (The)**]
12. [**Shurjoint; a part of Aalberts Integrated Piping Systems**]
13. [**Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America**]
14. [**United Brass Works, Inc**]
15. [**Venus Fire Protection Ltd.**]
16. [**Victaulic Company**]
17. [**Viking Group Inc.**]
18. [**WATTS; A Watts Water Technologies Company**]
19. [**Wilson & Cousins Inc.**]
20. [**Zurn Industries, LLC**]
21. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [**ALEUM USA**]
2. [**Ames Fire & Waterworks; A Watts Water Technologies Company**]
3. [**Anvil; an ASC Engineered Solution**]
4. [**FEBCO; A WATTS Brand**]
5. [**Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International**]
6. [**Globe Fire Sprinkler Corporation**]
7. [**Kennedy Valve Company; a division of McWane, Inc.**]

General-Duty Valves for Water-Based Fire-Suppression

8. [Matco-Norca]
9. [Mueller Co. LLC; Mueller Water Products, Inc.]
10. [NIBCO INC.]
11. [Reliable Automatic Sprinkler Co., Inc. (The)]
12. [Shurjoint; a part of Aalberts Integrated Piping Systems]
13. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
14. [United Brass Works, Inc]
15. [Venus Fire Protection Ltd.]
16. [Victaulic Company]
17. [Viking Group Inc.]
18. [WATTS; A Watts Water Technologies Company]
19. [Wilson & Cousins Inc.]
20. [Zurn Industries, LLC]
21. <Insert manufacturer's name>

C. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel[**with elastomeric seal**].
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.7 BRONZE OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [Milwaukee Valve Company]
2. [NIBCO INC.]
3. [United Brass Works, Inc]
4. [Zurn Industries, LLC]
5. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [Milwaukee Valve Company]
2. [NIBCO INC.]
3. [United Brass Works, Inc]
4. [Zurn Industries, LLC]
5. <Insert manufacturer's name>

C. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).

2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
3. Body and Bonnet Material: Bronze or brass.
4. Wedge: One-piece bronze or brass.
5. Wedge Seat: Bronze.
6. Stem: Bronze or brass.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Threaded.

2.8 IRON OS&Y GATE VALVES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[American Cast Iron Pipe Company]**
2. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
3. **[FNW; Ferguson Enterprises, Inc.]**
4. **[Hammond Valve]**
5. **[Kennedy Valve Company; a division of McWane, Inc.]**
6. **[Mueller Co. LLC; Mueller Water Products, Inc.]**
7. **[NIBCO INC.]**
8. **[Victaulic Company]**
9. **[WATTS; A Watts Water Technologies Company]**
10. **[Zurn Industries, LLC]**
11. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[American Cast Iron Pipe Company]**
2. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
3. **[FNW; Ferguson Enterprises, Inc.]**
4. **[Hammond Valve]**
5. **[Kennedy Valve Company; a division of McWane, Inc.]**
6. **[Mueller Co. LLC; Mueller Water Products, Inc.]**
7. **[NIBCO INC.]**
8. **[Victaulic Company]**
9. **[WATTS; A Watts Water Technologies Company]**
10. **[Zurn Industries, LLC]**
11. **<Insert manufacturer's name>**

- C. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze[**with elastomeric coating**].
5. Wedge Seat: Cast or ductile iron, or bronze[**with elastomeric coating**].
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: **[Flanged][Grooved][Threaded]**.

General-Duty Valves for Water-Based Fire-Suppression

2.9 NRS GATE VALVES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[American Cast Iron Pipe Company]**
 2. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 3. **[Mueller Co. LLC; Mueller Water Products, Inc.]**
 4. **[NIBCO INC.]**
 5. **[Victaulic Company]**
 6. **[Zurn Industries, LLC]**
 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[American Cast Iron Pipe Company]**
 2. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 3. **[Mueller Co. LLC; Mueller Water Products, Inc.]**
 4. **[NIBCO INC.]**
 5. **[Victaulic Company]**
 6. **[Zurn Industries, LLC]**
 7. **<Insert manufacturer's name>**
- C. Description:
1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
 2. Minimum Pressure Rating: **175 psig (1200 kPa)**.
 3. Body and Bonnet Material: Cast or ductile iron.
 4. Wedge: Cast or ductile iron **[with elastomeric coating]**.
 5. Wedge Seat: Cast or ductile iron, or bronze **[with elastomeric coating]**.
 6. Stem: Brass or bronze.
 7. Packing: Non-asbestos PTFE.
 8. Supervisory Switch: External.
 9. End Connections: **[Flanged][Grooved][Threaded]**.

2.10 INDICATOR POSTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[American Cast Iron Pipe Company]**
 2. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 3. **[Kennedy Valve Company; a division of McWane, Inc.]**
 4. **[Mueller Co. LLC; Mueller Water Products, Inc.]**
 5. **[NIBCO INC.]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [American Cast Iron Pipe Company]
2. [Clow Valve Company; a subsidiary of McWane, Inc.]
3. [Kennedy Valve Company; a division of McWane, Inc.]
4. [Mueller Co. LLC; Mueller Water Products, Inc.]
5. [NIBCO INC.]
6. <Insert manufacturer's name>

C. Description:

1. Standard: UL 789 and FM Global standard for indicator posts.
2. Type: [Underground][Pit][Wall][Upright].
3. Base Barrel Material: [Cast or ductile iron][PVC].
4. Extension Barrel: Cast or ductile iron.
5. Cap: Cast or ductile iron.
6. Operation: [Wrench][Handwheel].

2.11 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Croker; a Division of Morris Group International]
 - c. [Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]
 - d. [Flowserve Corporation]
 - e. [Jomar Valve]
 - f. [KITZ Corporation]
 - g. [Metso Automation USA Inc.]
 - h. [Milwaukee Valve Company]
 - i. [NIBCO INC.]
 - j. [Potter Roemer LLC; a Division of Morris Group International]
 - k. [Red-White Valve Corp.]
 - l. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - m. [Victaulic Company]
 - n. [WATTS; A Watts Water Technologies Company]
 - o. [Zurn Industries, LLC]
 - p. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Croker; a Division of Morris Group International]
 - c. [Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]
 - d. [Flowserve Corporation]
 - e. [Jomar Valve]

General-Duty Valves for Water-Based Fire-Suppression



- f. [KITZ Corporation]
- g. [Metso Automation USA Inc.]
- h. [Milwaukee Valve Company]
- i. [NIBCO INC.]
- j. [Potter Roemer LLC; a Division of Morris Group International]
- k. [Red-White Valve Corp.]
- l. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
- m. [Victaulic Company]
- n. [WATTS; A Watts Water Technologies Company]
- o. [Zurn Industries, LLC]
- p. <Insert manufacturer's name>

3. Description:

- a. Pressure Rating: [175 psig (1200 kPa)][250 psig (1720 kPa)][300 psig (2070 kPa)]<Insert value>.
- b. Body Design: Two piece.
- c. Body Material: Forged brass or bronze.
- d. Port size: Full or standard.
- e. Seats: PTFE.
- f. Stem: Bronze or stainless steel.
- g. Ball: Chrome-plated brass.
- h. Actuator: Handlever.
- i. End Connections for Valves **NPS 1 (DN 25)** through **NPS 2-1/2 (DN 65)**: Threaded ends.
- j. End Connections for Valves **NPS 1-1/4 and NPS 2-1/2 (DN 32 and DN 65)**: Grooved ends.

B. Angle Valves:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]
- b. [NIBCO INC.]
- c. [United Brass Works, Inc]
- d. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]
- b. [NIBCO INC.]
- c. [United Brass Works, Inc]
- d. <Insert manufacturer's name>

3. Description:

- a. Pressure Rating: [175 psig (1200 kPa)][250 psig (1720 kPa)][300 psig (2070 kPa)].
- b. Body Material: Brass or bronze.

- c. Ends: Threaded.
- d. Stem: Bronze.
- e. Disc: Bronze.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[NIBCO INC.]**
 - b. **[United Brass Works, Inc]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[NIBCO INC.]**
 - b. **[United Brass Works, Inc]**
 - c. **<Insert manufacturer's name>**
3. Description:
 - a. Pressure Rating: **[175 psig (1200 kPa)][250 psig (1720 kPa)][300 psig (2070 kPa)]**.
 - b. Body Material: Bronze with integral seat and screw-in bonnet.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc Holder and Nut: Bronze.
 - f. Disc Seat: Nitrile.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

- E. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION, GENERAL

- A. Comply with requirements in the following Sections for specific valve-installation requirements and applications:
 - 1. Section 211000 "Water-Based Fire-Suppression Systems" for application of valves in fire-suppression standpipes; wet-pipe, fire-suppression sprinkler systems; and dry-pipe, fire-suppression sprinkler systems.
 - 2. Section 211339 "Foam-Water Systems" for application of valves in AFFF piping.
 - 3. Section 331415 "Site Water Distribution Piping" for application of valves in fire-suppression water-service piping.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply, except from fire-department connections. Install permanent identification signs, indicating portion of system controlled by each valve.
- C. Install double-check valve assembly in each fire-protection water-supply connection.
- D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the pipe center.
- F. Install valves in position to allow full stem movement.
- G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

END OF SECTION 21 05 23 00



Task	Specification	Specification Description
21 05 23 00	01 91 13 00a	Commissioning Of Fire Suppression



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SECTION 21 05 29 00 - HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports for fire-suppression piping - metal.
2. Pipe hangers for fire-suppression piping - metal, trapeze type.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. **[Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment"]****[Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment"]** for vibration isolation devices **[and seismic restraints]**.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings: **[Signed and sealed by a qualified professional engineer.]** Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated Design Submittals: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel in accordance with AWS

D1.1/D1.1M.

- B. Pipe Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.
- B. Structural Performance: Hangers and supports for fire-suppression piping and equipment are to withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with **[ASCE/SEI 7]<Insert requirement>**.
 - 1. Design supports for multiple pipes, including pipe stands capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment[**and obtain approval from authorities having jurisdiction**].
- C. NFPA Compliance: Comply with **[NFPA 13][NFPA 13R]<Insert standard>**.
- D. UL Compliance: Comply with UL 203.

2.2 PIPE HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING - METAL

- A. Pipe Hangers and Supports for Fire-Suppression Piping - Carbon Steel:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **<Insert manufacturer's name>**

3. Description: Factory-fabricated components, NFPA approved, UL listed, or FM Global approved for fire-suppression piping support.
4. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[carbon steel][stainless steel]<Insert material>**.

B. Pipe/Tube Hangers and Supports for Fire-Suppression Piping - Copper:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Copper-coated-steel, factory-fabricated components, NFPA approved, UL listed, or FM Global approved for fire-suppression piping support.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[copper-coated steel][stainless steel]<Insert material>**.

2.3 PIPE HANGERS FOR FIRE-SUPPRESSION PIPING - METAL, TRAPEZE TYPE

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM Global-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Buckaroos, Inc.]**
 2. **[Carpenter & Paterson, Inc]**
 3. **[KB Enterprise]**
 4. **[National Pipe Hanger Corporation]**
 5. **[Pipe Shields Inc.]**
 6. **[Piping Technology & Products, Inc]**
 7. **[Rilco Manufacturing Co., Inc]**
 8. **[Value Engineered Products, Inc]**
 9. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Buckaroos, Inc.]**
 2. **[Carpenter & Paterson, Inc]**
 3. **[KB Enterprise]**
 4. **[National Pipe Hanger Corporation]**
 5. **[Pipe Shields Inc.]**
 6. **[Piping Technology & Products, Inc]**
 7. **[Rilco Manufacturing Co., Inc]**
 8. **[Value Engineered Products, Inc]**
 9. **<Insert manufacturer's name>**
- C. Insulation-Insert Material: **[Water-repellent-treated, ASTM C533, Type I calcium silicate with 100 psi (688 kPa)][ASTM C552, Type II cellular glass with 100 psi (688 kPa)][or][ASTM C591, Type VI, Grade 1 polyisocyanurate with 125 psi (862 kPa)]** minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield are to cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield are to cover lower 180 degrees of pipe.
- F. Insert Length: Extend **2 inches (50 mm)** beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Fastener System - NFPA/UL/FM Powder-Actuated Fasteners: NFPA-approved, UL-listed, or FM Global-approved threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Hilti, Inc.]**
 - b. **[ITW Ramset/Red Head; Illinois Tool Works, Inc.]**
 - c. **[MKT Fastening, LLC]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Hilti, Inc.]**
 - b. **[ITW Ramset/Red Head; Illinois Tool Works, Inc.]**
 - c. **[MKT Fastening, LLC]**
 - d. **<Insert manufacturer's name>**
- B. Fastener System - NFPA/UL/FM Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM Global-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Cooper B-line; brand of Eaton, Electrical Sector]
 - b. [Empire Industries, Inc.]
 - c. [Hilti, Inc.]
 - d. [ITW Ramset/Red Head; Illinois Tool Works, Inc.]
 - e. [MKT Fastening, LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Cooper B-line; brand of Eaton, Electrical Sector]
 - b. [Empire Industries, Inc.]
 - c. [Hilti, Inc.]
 - d. [ITW Ramset/Red Head; Illinois Tool Works, Inc.]
 - e. [MKT Fastening, LLC]
 - f. <Insert manufacturer's name>
3. Indoor Applications: [Zinc coated][or][Stainless].
4. Outdoor Applications: Stainless steel.

2.6 EQUIPMENT SUPPORTS

- A. Description: NFPA-approved, UL-listed, or FM Global-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.7 MATERIALS

- A. Aluminum: **ASTM B221 (ASTM B221M)**.
- B. Carbon Steel: ASTM A1011/A1011M.
- C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout, suitable for interior and exterior applications.
 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: **5000 psi (34.5 MPa)**, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry static loads within specified loading limits. Minimum static design load used for strength determination is to comply with NFPA 13 requirements, minimum **[5 times]<Insert multiplication factor>** the water-filled weight of piping and supported components plus **[250 lb (114 kg)]<Insert value>**.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- B. Install lateral bracing with pipe hangers and supports to prevent swaying.
- C. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **[NPS 2-1/2 (DN 65)]<Insert pipe size>** and larger **[and at changes in direction of piping]**. Coordinate location of concrete inserts before concrete is placed.
- D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- E. Pipe Slopes: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- F. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- G. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel in accordance with AWS D1.1/D1.1M.
- H. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- I. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than **4 inches (100 mm)** thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners in accordance

- with powder-actuated tool manufacturer's operating manual. Install in accordance with approvals and listings.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners in accordance with manufacturer's written instructions. Install in accordance with approvals and listings.
- J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- K. Equipment Support Installation:
1. Fabricate from welded-structural-steel shapes.
 2. Grouting: Place grout under supports for floor-mounted equipment and make bearing surface smooth.
 3. Provide lateral bracing, to prevent swaying.
- L. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. MSS SP-58, Type 39 Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe **NPS 4 (DN 100)** and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields are to span an arc of 180 degrees.
 - a. MSS SP-58, Type 40 Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe **NPS 4 (DN 100)** and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): **12 inches (305 mm)** long and **0.048 inch (1.22 mm)** thick.
 - b. NPS 4 (DN 100): **12 inches (305 mm)** long and **0.06 inch (1.52 mm)** thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): **18 inches (457 mm)** long and **0.06 inch (1.52 mm)** thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): **24 inches (610 mm)** long and **0.075 inch (1.91 mm)** thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): **24 inches (610 mm)** long and **0.105 inch (2.67 mm)** thick.
 5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 INSTALLATION OF EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for **[trapeze pipe hangers][and][equipment supports]**.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to **[1-1/2 inches (40 mm)]<Insert dimension>**.

3.6 PAINTING

- A. Touchup:
 - 1. Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - a. Apply paint by brush or spray to provide a minimum dry film thickness of **2.0 mils (0.05 mm)**.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in **[Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]**

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel **[pipe hangers and supports][and][metal trapeze pipe hangers]** and attachments for general service applications.
- F. Use **[stainless steel]<Insert material>** pipe hangers and **[stainless steel][or][corrosion-resistant]** attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and **[copper][or][stainless steel]** attachments for copper piping and tubing.
- H. Use thermal hanger-shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes **NPS 1/2 to NPS 30 (DN 15 to DN 750)**.
 - 2. Steel Pipe Clamps (MSS Type 4): For suspension of **NPS 1/2 to NPS 24 (DN 15 to DN 600)** if little or no insulation is required.
 - 3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes **NPS 1/2 to NPS 8 (DN 15 to DN 200)**.
 - 4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes **NPS 3/8 to NPS 8 (DN 10 to DN 200)**.
 - 5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes **NPS 3/8 to NPS 3 (DN 10 to DN 80)**.
 - 6. U-Bolts (MSS Type 24): For support of heavy pipes **NPS 1/2 to NPS 30 (DN 15 to DN 750)**.
 - 7. Pipe Saddle Supports (MSS Type 36): For support of pipes **NPS 4 to NPS 36 (DN 100 to DN 900)**, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes **NPS 4 to NPS 36 (DN 100 to DN 900)**, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes **NPS 2-1/2 to NPS 36 (DN 65 to DN 900)** if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:



1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers **NPS 3/4 to NPS 24 (DN 24 to DN 600)**.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers **NPS 3/4 to NPS 24 (DN 20 to DN 600)** if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Comply with NFPA requirements.
- L. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. C-Clamps (MSS Type 23): For structural shapes.
 3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- M. Saddles and Shields: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.
- N. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Use **[powder-actuated fasteners][or][mechanical-expansion anchors]** instead of building attachments where required in concrete construction.

END OF SECTION 21 05 29 00



Task	Specification	Specification Description
21 05 29 00	21 05 33 00	Heat Tracing for Fire-Suppression Piping



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SECTION 21 05 33 00 - HEAT TRACING FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Self-regulating, parallel-resistance heating cables.

B. Related Requirements:

1. Section 220533 "Heat Tracing for Plumbing Piping."
2. Section 230533 "Heat Tracing for HVAC Piping."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables and controls to include in operation and maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: [Three][Five][10]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Chromalox, Inc.]**
 2. **[RAYCHEM; brand of nVent Electrical plc]**
 3. **[Thermon, Inc.]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Chromalox, Inc.]**
 2. **[RAYCHEM; brand of nVent Electrical plc]**
 3. **[Thermon, Inc.]**
 4. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain all heat tracing from one manufacturer.
- D. Standard: IEEE 515.1.
- E. Heating Element: Pair of parallel **[No. 16][No. 18]** AWG, **[tinned][nickel-coated]**, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length.
- F. Electrical Insulating Jacket: Flame-retardant polyolefin.
- G. Grounding Cover: **[Copper][Tinned-copper]** braid.
- H. Cable Cover: Polyolefin outer jacket with ultraviolet inhibitor.
- I. Terminate cable with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable is to be capable of crossing over itself once without overheating.
- J. Maximum Operating Temperature (Power On): **[150 deg F (65 deg C)][<Insert temperature>]**.
- K. Maximum Exposure Temperature (Power Off): **[185 deg F (85 deg C)][<Insert temperature>]**.
- L. Electrical Components, Devices, and Accessories: Listed and labeled for fire protection use as defined in NFPA 70 and NFPA 13 by a qualified testing agency, and marked for intended location and application. All heating cable used on branch sprinkler piping is to be listed and labeled by a qualified testing agency specifically for this use.
- M. Capacities and Characteristics:
1. Maximum Heat Output: **[3 W/ft. (9.8 W/m)][5 W/ft. (16.4 W/m)][8 W/ft. (26 W/m)][10 W/ft. (32.8 W/m)][12 W/ft. (39.4 W/m)][<Insert value>]**.
 2. Piping Diameter: **<Insert NPS (DN)>**.
 3. Number of Parallel Cables: **<Insert number>**.

4. Spiral Wrap Pitch: **<Insert inches (mm)>**.
5. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: **[120][208][240][277][480]<Insert number> V**.
 - b. Phase: **<Insert value>**.
 - c. Hertz: **<Insert number> Hz**.
 - d. Full-Load Amperes: **<Insert number> A**.
 - e. Minimum Circuit Ampacity: **<Insert number> A**.
 - f. Maximum Overcurrent Protection: **<Insert number> A**.

2.2 CONTROLS

A. Control Panel:

1. **[Microprocessor-based][Automatic]** control with manual on, automatic, and standby/reset switch.
2. Remote temperature sensor senses outside air temperature; programmable to energize the cable when temperature falls below **[34 to 44 deg F (1 to 7 deg C)]<Insert temperature range>**.
3. Corrosion-proof and waterproof enclosure suitable for outdoor mounting, for controls and temperature sensors.
4. Minimum 30 A contactor to energize cable or close other contactors.
5. Ground-fault protection.
6. Single-point control of heat tracing for freeze protection.
7. Provide communication ports with contacts, RS485, or Ethernet interface for remote monitoring and alarm by fire-alarm system. Coordinate type of connection ports with **[Section 284600 "Fire Detection and Alarm."][Section 284614 "Single- and Multiple-Station Alarms."][Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."]**

2.3 ACCESSORIES

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer or as recommended in writing by manufacturer.
- B. Warning Labels: See Section 210553 "Identification for Fire-Suppression Piping and Equipment."
- C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least **3 mils (0.08 mm)** thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 1. Width for Markers on Pipes with OD, Including Insulation, Less Than **6 Inches (150 mm)**: **3/4 inch (19 mm)** minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, **6 Inches (150 mm)** or Larger: **1-1/2 inches (38 mm)** minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install electric heating cable at locations indicated and install in accordance with NFPA 70 and NFPA 13.
- B. Install electric heating cable across expansion, construction, and control joints in accordance with manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- C. Install electric heating cables after piping has been tested and before insulation is installed.
- D. Install electric heating cables in accordance with IEEE 515.1.
- E. Install insulation over piping with electric cables in accordance with Section 210700 "Fire-Suppression Systems Insulation."
- F. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- G. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Install temperature-control units in an accessible location and according to manufacturer's written instructions. Locate sensing bulbs to sense outside air temperature in a location where it will not be affected by direct sunlight or other heat sources.
- I. Install control panels and distribution panels where indicated and in accordance with manufacturer's written instructions.
- J. Install and connect outside air and pipe temperature sensors.

3.3 ELECTRICAL CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Connect heat-tracing controls to fire-alarm system in accordance with NFPA 13. Comply with requirements in [**Section 284600 "Fire Detection and Alarm."**][**Section 284614 "Single- and Multiple-Station Alarms."**][**Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."**]
- D. Connect temperature-control unit to interrupt power supply to electric heating cable when outside air is above set point.
- E. Connect remote electronic temperature sensors.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Perform tests after cable installation but before application of coverings, such as insulation, wall or ceiling construction, or concrete.
 - 2. Test cables for electrical continuity and insulation integrity before energizing.
 - 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- E. Cables will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 PROTECTION

- A. Protect installed heating cables, including nonheating leads, from damage.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION 21 05 33 00



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SECTION 21 05 48 00 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Elastomeric hangers.
5. Snubbers.
6. Restraints - rigid type.
7. Restraints - cable type.
8. Restraint accessories.
9. Post-installed concrete anchors.
10. Concrete inserts.

B. Related Requirements:

1. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components.
2. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" specifies devices for plumbing equipment and systems.
3. Section 230548 "Vibration and Seismic Controls for HVAC" specifies devices for HVAC equipment and systems.

1.2 DEFINITIONS

- A. Designated Seismic System:** An architectural, mechanical, electrical, plumbing, or fire-protection system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
- B. IBC:** International Building Code.
- C. OSHPD:** Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.3 DELEGATED DESIGN SERVICES

- A. Delegated Design Professional:** Engage qualified professional structural engineer to design seismic and wind restraints.

1.4 ACTION SUBMITTALS

- A. Product Data:**

1. For each type of product.
 - a. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - b. Include load rating for each seismic-[**and wind**]-restraint device.
 - c. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-[**and wind**]-restraint component.
 - d. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by **[ICC-ES product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]**.
 - e. Annotate to indicate application of each product submitted and compliance with requirements.
 - f. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
3. Show coordination of seismic[**and wind**] restraints for components with other systems and equipment in the vicinity, including other supports and other seismic restraints.

C. Delegated Design Submittal:

1. All delegated design and submittals for **[seismic][and][wind]** restraints must be signed and sealed by a qualified professional structural engineer responsible for their preparation. Structural engineer is to possess qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including design of seismic and wind restraints, equipment hangers and supports, and concrete attachments.
2. For each seismic-restraint device, including **[seismic-restrained mounting],[pipe-riser resilient support],[snubber],[seismic restraint],[seismic-restraint accessory],[and][concrete anchor and insert]** that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic Restraint, and Vibration Isolator Selection: Select and submit seismic restraints **[and vibration isolators]** complying with performance requirements, design criteria, and analysis data.
 - b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
 - c. Post-Installed Concrete Anchors and Concrete Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for reinforcement use.
 - d. Seismic Design Calculations: Submit all input data and loading calculations.
3. For each wind-restraint device, including **[restraint - rigid],[restraint - cable],[restraint accessory],[concrete anchor],[and][concrete insert]** that is required by this Section or is indicated on Drawings, submit the following:
 - a. Wind Restraints: Select and submit wind restraints complying with performance requirements, design criteria, and analysis data.
 - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated

- seismic loads. Include certification that device is approved by an NRTL for reinforcement use.
 - c. Wind-Restraint Design Calculations: Submit all input data and loading calculations.
4. Seismic- and Wind-Restraint Detail Drawing:
- a. Design Analysis: To support selection and arrangement of seismic[**and wind**] restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.
5. Product Listing, Preapproval, and Evaluation Documentation: By **[an evaluation service member of ICC-ES][UL][FM Approvals][OSHPD][an agency acceptable to authorities having jurisdiction]**, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
6. Riser Supports: Include riser diagrams and calculations showing initial and final loads on building structure, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation **[and wind-]** and seismic-restraint devices for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For **[professional engineer][and][testing agency]**.
- C. Welding certificates.
- D. Field quality-control reports.

1.6 REGULATORY AGENCY APPROVALS

- A. Delegated design submittals and Shop Drawings requiring approval by authorities having jurisdiction must be signed by qualified structural professional engineer responsible for their preparation. **[Obtain approval by authorities having jurisdiction prior to submitting for action by Architect.][Submit for action by Architect prior to submitting for approval by authorities having jurisdiction.]**

1.7 QUALIFICATIONS

- A. Professional Structural Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including design of seismic and wind restraints, equipment hangers and supports, and concrete foundations.



1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional structural engineer to prepare seismic- and wind-restraint calculations in accordance with criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
- B. Seismic- and Wind-Restraint-Device Ratings: Devices are to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices are to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: **[ICC-ED product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][an agency acceptable to the authorities having jurisdiction]**.
- C. Consequential Damage: Provide additional seismic **[and wind]** restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a nonessential or essential component will not cause failure of any other essential building component.
- D. Fire/Smoke Resistance: Seismic- and wind-restraint devices that are not constructed of ferrous metals are to have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by qualified testing laboratory in accordance with ASTM E84 or UL 723 and be labeled as such.
- E. Component Supports:
 - 1. Load ratings, features, and applications of reinforcement components are to be based on testing standards of qualified testing laboratory.

2.2 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**

- e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
3. Source Limitations: Obtain elastomeric isolation pads from single manufacturer.
 4. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 5. Size: Factory or field cut to match requirements of supported equipment.
 6. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
 7. Surface Pattern: Smooth, ribbed, or waffle pattern.
 8. Infused nonwoven cotton or synthetic fibers.
 9. Load-bearing metal plates adhered to pads.
 10. Sandwich-Core Material: [Resilient][and][elastomeric]<Insert compound>.
- a. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]

- d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
3. Source Limitations: Obtain double-deflection, elastomeric isolation mounts from single manufacturer.
4. Mounting Plates:
- a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded[**with threaded studs or bolts**].
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
5. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]

- d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
 3. Source Limitations: Obtain restrained elastomeric isolation mounts from single manufacturer.
 4. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Kinetics Noise Control, Inc]
 - e. [Mason Industries, Inc.]
 - f. [NOVIA; a division of Carpenter & Paterson]
 - g. [Vibration Eliminator Co., Inc]
 - h. [Vibration Isolation]

- i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
3. Source Limitations: Obtain elastomeric hangers from a single manufacturer.
4. Description: Elastomeric hanger mounted in a steel frame with upper and lower steel hanger rods.
5. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
6. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.6 SNUBBERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Kinetics Noise Control, Inc]**
 3. **[Mason Industries, Inc.]**
 4. **[Vibration Management Corp.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Kinetics Noise Control, Inc]**
 3. **[Mason Industries, Inc.]**
 4. **[Vibration Management Corp.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain snubbers from single manufacturer.

- D. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with **[ACI 318-08 Appendix D for 2009 IBC][ACI 318-11 Appendix D for 2012 IBC][ACI 318-14, Ch. 17 for 2015 or 2018 IBC]**.
 2. Preset Concrete Inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
 3. Anchors in Masonry: Design in accordance with TMS 402.
 4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 5. Resilient Cushion: Maximum **1/4-inch (6-mm)** air gap, and minimum **1/4 inch (6 mm)** thick.

2.7 RESTRAINTS - RIGID TYPE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[California Dynamics Corporation]**
 4. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 5. **[Hilti, Inc.]**
 6. **[Isolation Technology, Inc]**
 7. **[TOLCO Incorporated]**
 8. **[VMC GROUP]**
 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[California Dynamics Corporation]**
 4. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 5. **[Hilti, Inc.]**
 6. **[Isolation Technology, Inc]**
 7. **[TOLCO Incorporated]**
 8. **[VMC GROUP]**
 9. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain rigid-type restraints from single manufacturer.
- D. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.8 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be**

incorporated into the Work include, but are not limited to, the following]:

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

C. Source Limitations Obtain cable-type restraints from single manufacturer.

D. Seismic- and Wind-Restraint Cables: [ASTM A1023/A12023M galvanized or ASTM A603 galvanized-steel][ASTM A492 stainless steel] cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

E. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.9 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [Cooper B-line; brand of Eaton, Electrical Sector]
4. [Hilti, Inc.]
5. [Loos & Co. Inc.]
6. [Mason Industries, Inc.]
7. [TOLCO Incorporated]
8. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [Cooper B-line; brand of Eaton, Electrical Sector]
4. [Hilti, Inc.]
5. [Loos & Co. Inc.]

6. **[Mason Industries, Inc.]**
7. **[TOLCO Incorporated]**
8. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain restraint accessories from single manufacturer.
- D. Hanger-Rod Stiffener: **[Steel tube or steel slotted-support-system sleeve with internally bolted connections][Reinforcing steel angle clamped]** to hanger rod. Non-metallic stiffeners are unacceptable.
- E. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to **[rigid restraints][and][restraint cables]**.
- F. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.10 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain mechanical anchor bolts from single manufacturer.
 4. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested

according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain adhesive anchor bolts from single manufacturer.
 4. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.
- C. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of **[ASCE/SEI 7-05, Ch. 13][ASCE/SEI 7-10, Ch. 13][ASCE/SEI 7-16, Ch. 13]**.
1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of **10 hp (7.46 kW)** that is not vibration isolated.
1. Undercut expansion anchors are permitted.

2.11 CONCRETE INSERTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [Atkore Unistrut]
 2. [Cooper B-line; brand of Eaton, Electrical Sector]
 3. [Hilti, Inc.]
 4. [Mason Industries, Inc.]
 5. [Powers Fasteners]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Atkore Unistrut]
 2. [Cooper B-line; brand of Eaton, Electrical Sector]
 3. [Hilti, Inc.]
 4. [Mason Industries, Inc.]
 5. [Powers Fasteners]
 6. <Insert manufacturer's name>
- C. Source Limitations: Obtain concrete inserts from single manufacturer.
- D. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.
- E. Comply with ANSI/MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation[, **wind-restraint,**] and seismic-restraint devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by [an **evaluation service member of ICC-ES**][**OSHPD**][an agency acceptable to authorities having jurisdiction].
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Assemblies: Where not specifically indicated otherwise, select sizes of components so strength is adequate to carry static[, **wind load,**] and seismic loads within specified loading limits.

3.3 INSTALLATION OF VIBRATION CONTROLS AND SEISMIC RESTRAINTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

- A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Fire-Suppression Vibration Isolation, Seismic-Restraint, and Wind-Restraint Schedules, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.
- B. Provide seismic-restraint **[and wind-restraint]** devices for systems and equipment where indicated in Equipment Schedules or Vibration Isolation, Seismic-Restraint, and Wind-Restraint Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
- C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- D. Installation of vibration isolators[, **wind restraints**,] and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.
- E. Comply with installation requirements of NFPA 13 for installation of all seismic-restraint devices.
- F. Comply with requirements in Section 077200 "Roof Accessories" for installation of equipment supports and roof penetrations.
- G. Equipment Restraints:
 - 1. Install snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds **0.125 inch (3.2 mm)**.
 - 3. Install seismic-restraint devices using methods approved by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]** that provides required submittals for component.
- H. Piping Restraints:
 - 1. Comply with all requirements in NFPA 13.
 - 2. Design piping sway bracing in accordance with NFPA 13.
 - a. Maximum spacing of all sway bracing to be no greater than indicated in NFPA 13.
 - b. Design loading of all sway bracing not to exceed values indicated in NFPA 13.
- I. Install seismic-**[and wind-]**restraint devices using methods approved by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]** that provides required submittals for component.
- J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

- L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- M. Post-Installed Concrete Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Mechanical Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors to be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross structural seismic joints and other points where differential movement may occur, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211000 "Water-Based Fire-Suppression Systems" for piping flexible connections.

3.5 ADJUSTING

- A. Adjust isolators after system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

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3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at no fewer than **[four]<Insert number>** of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Units will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 21 05 48 00

SECTION 21 05 48 13 - VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Elastomeric hangers.
5. Snubbers.
6. Restraints - rigid type.
7. Restraints - cable type.
8. Restraint accessories.
9. Post-installed concrete anchors.
10. Concrete inserts.

B. Related Requirements:

1. Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
2. Section 230548.13 "Vibration Controls for HVAC" for devices for HVAC equipment and systems.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. OSHPD: Office of Statewide Health Planning and Development (for the State of California).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Include load rating for each wind-load-restraint fitting and assembly.
3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device **[and wind-load-restraint]** component.
4. Annotate to indicate application of each product submitted and compliance with requirements.
5. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal:



1. For each wind-load protection device that is required by this Section or is indicated on Drawings, submit the following:
 - a. Wind-Load-Restraint Selection: Select wind-load restraints complying with performance requirements, design criteria, and analysis data.
 - b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
 - c. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated wind loads.
 - d. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" Paragraph in "Performance Requirements" Article.
 - e. Qualified Professional Engineer: All designated-design submittals for wind-load-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.
2. Wind-Load-Restraint Detail Drawing:
 - a. Design Analysis: To support selection and arrangement of wind-load restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during wind events. Indicate association with vibration isolation devices.
 - c. All delegated-design submittals for wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
3. Product Listing, Preapproval, and Evaluation Documentation: By **[an evaluation service member of ICC-ES][UL][FM Approvals][OSHPD][an agency acceptable to authorities having jurisdiction]**, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
4. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure. Include certification that riser system was examined for excessive stress and that none exists.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation **[and wind-load reinforcement]** device installation for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For **[professional engineer][and][testing agency]**.
- C. Welding certificates.
- D. Field quality-control reports.
- E. Wind-Load Performance Certification: Provide special certification for fire-suppression system components subject to high wind exposure and impact damage and designated on Drawings or in the Specifications to require wind-load performance certification.

1. Provide equipment manufacturer's written certification for each designated fire suppression system device, stating that it will remain in place and operable following the design wind event and comply with all requirements of authorities having jurisdiction.
2. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.
3. The following fire-suppression system systems and components require special certification for high wind performance. Written special certification of resistance to the effects of high wind load and impact damage must be provided by manufacturer.
 - a. <Insert list>.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: **[ICC-ES product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][an agency acceptable to authorities having jurisdiction]**.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wind-load-restraint system.
 1. Wind-Load Performance: Equipment must be designed and secured to withstand effects of high wind events determined in accordance with **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]<Insert requirement>**.
- B. Wind-Load Design Calculations:
 1. Comply with wind-load-restraint requirements of all applicable codes and authorities having jurisdiction.
 2. Perform calculations to obtain force information necessary to properly select wind-load-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]<Insert ASCE/SEI 7 edition or other wind-load calculation method required by authorities having jurisdiction>**. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise noted.
 - a. Factors indicated below that are specific to individual pieces of equipment must be



- obtained by Contractor and must be included in individual component submittal packages.
- b. Coordinate design wind-load calculations with vibration isolation calculations for equipment requiring both wind-load reinforcement and vibration isolation. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.
3. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:
 - a. PART 1: Low-Rise Buildings.
 - b. PART 2: Low-Rise Buildings (Simplified).
 - c. PART 3: Buildings with "h" less than **60 ft. (18.3 m)**.
 - d. PART 4: Buildings with "h" greater than **60 ft. (18.3 m)** and less than **160 ft. (48.8 m)**.
 - e. PART 5: Open Buildings.
 4. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - a. Risk Category: **[I][II][III][IV][V]**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. Kd = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. Kzt = Topographic Factor: **<Insert factor>**.
 - g. Ke = Ground Elevation Factor: **<Insert factor>**.
 - h. Kz = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.
 - i. Kh = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - j. qz = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - k. qh = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - l. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - m. Enclosure Classification: **<Insert classification>**.
 - n. GCpi = Internal Pressure Coefficient: **<Insert coefficient>**.
 5. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using the methods in ASCE/SEI 7-10, Ch. 30. Perform calculations according to PART 1: -Rise Buildings, PART 2: Low-Rise Buildings (Simplified), PART 3: Buildings with "h" greater than **60 ft. (18.3 m)**, PART 4: Buildings with "h" less than **160 ft. (48.8 m)**, or PART 5: Open Buildings, as appropriate.
 6. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - a. Risk Category: **[I][II][III][IV][V]**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. Kd = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. Kzt = Topographic Factor: **<Insert factor>**.
 - g. Kz = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.

- h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - i. q_z = Velocity Pressure at Height z : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - j. q_h = Velocity Pressure at Height h : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - k. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - l. Enclosure Classification: **<Insert classification>**.
 - m. G_{Cpi} = Internal Pressure Coefficient: **<Insert coefficient>**.
7. Design wind force "F" for rooftop equipment and external sidewall-mounted equipment such as louvers is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-05, Ch. 6.
- a. I = Importance Factor: **<Insert factor>**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. K_d = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. K_{zt} = Topographic Factor: **<Insert factor>**.
 - g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.
 - h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - i. q_z = Velocity Pressure at Height z : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
 - j. q_h = Velocity Pressure at Roof Height h : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
 - k. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - l. G_{Cpi} = Internal Pressure Coefficient: **<Insert coefficient>**.
 - m. G_{Cp} = External Pressure Coefficient: **<Insert coefficient>**.
 - n. C_f = Force Coefficient: Value determined by delegated wind-load design Contractor from ASCE/SEI 7-05, Figures 6-21 through 6-23 or other source approved by authorities having jurisdiction.
 - o. A_f = Projected Area Normal to the Wind: Except where C_f is specified for the actual surface area, value determined by delegated wind-load design Contractor from equipment submittal or manufacturer.
- C. Consequential Damage: Provide additional restraints for suspended fire-suppression system components or anchorage of floor-, roof-, or wall-mounted fire-suppression system components as indicated in **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]** so that failure of a non-essential or essential fire-suppression system component will not cause the failure of any other essential architectural, mechanical, or electrical building component.
- D. Fire/Smoke Resistance: All devices and components that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- E. Component Supports:
- 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
 - 2. All component support attachments must comply with force and displacement resistance requirements of **[ASCE/SEI 7-05 Section 13.6][ASCE/SEI 7-10 Section 13.6][ASCE/SEI 7-16]**

Section 13.6].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
4. Size: Factory or field cut to match requirements of supported equipment.
5. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
6. Surface Pattern: Smooth, ribbed, or waffle pattern.
7. Infused nonwoven cotton or synthetic fibers.
8. Load-bearing metal plates adhered to pads.
9. Sandwich-Core Material: **[Resilient][and][elastomeric]<Insert compound>**.

- a. Surface Pattern: Smooth, ribbed, or waffle pattern.
- b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded[**with threaded studs or bolts**].
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
4. Elastomeric Material: Molded, oil and water resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Kinetics Noise Control, Inc]
 - e. [Mason Industries, Inc.]
 - f. [NOVIA; a division of Carpenter & Paterson]
 - g. [Vibration Eliminator Co., Inc]
 - h. [Vibration Isolation]
 - i. [Vibration Management Corp.]
 - j. [VMC GROUP]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Kinetics Noise Control, Inc]
 - e. [Mason Industries, Inc.]
 - f. [NOVIA; a division of Carpenter & Paterson]
 - g. [Vibration Eliminator Co., Inc]
 - h. [Vibration Isolation]
 - i. [Vibration Management Corp.]
 - j. [VMC GROUP]
 - k. <Insert manufacturer's name>
3. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
4. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.6 SNUBBERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [CADDY; brand of nVent Electrical plc]
 2. [Kinetics Noise Control, Inc]
 3. [Mason Industries, Inc.]
 4. [Vibration Management Corp.]
 5. [VMC GROUP]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [Kinetics Noise Control, Inc]
3. [Mason Industries, Inc.]
4. [Vibration Management Corp.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

C. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with [ACI 318-08 Appendix D for 2009 IBC][ACI 318-11 Appendix D for 2012 IBC][ACI 318-14 Ch. 17 for 2015 or 2018 IBC].
2. Preset Concrete Inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch (6-mm) air gap, and minimum 1/4 inch (6 mm) thick.

2.7 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [California Dynamics Corporation]
4. [Cooper B-line; brand of Eaton, Electrical Sector]
5. [Hilti, Inc.]
6. [Isolation Technology, Inc]
7. [TOLCO Incorporated]
8. [VMC GROUP]
9. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [California Dynamics Corporation]
4. [Cooper B-line; brand of Eaton, Electrical Sector]
5. [Hilti, Inc.]
6. [Isolation Technology, Inc]
7. [TOLCO Incorporated]
8. [VMC GROUP]
9. <Insert manufacturer's name>

C. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.8 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 3. **[Gripple Inc.]**
 4. **[Loos & Co. Inc.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 3. **[Gripple Inc.]**
 4. **[Loos & Co. Inc.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- C. Seismic-Restraint Cables: **[ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel][ASTM A492 stainless steel]** cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.
- D. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.9 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 4. **[Hilti, Inc.]**
 5. **[Loos & Co. Inc.]**
 6. **[Mason Industries, Inc.]**
 7. **[TOLCO Incorporated]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 4. **[Hilti, Inc.]**

5. [Loos & Co. Inc.]
6. [Mason Industries, Inc.]
7. [TOLCO Incorporated]
8. <Insert manufacturer's name>

- C. Hanger-Rod Stiffener: **[Steel tube or steel slotted-support-system sleeve with internally bolted connections][Reinforcing steel angle clamped]** to hanger rod. Non-metallic stiffeners are unacceptable.
- D. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to **[rigid channel bracings][and][restraint cables]**.
- E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.10 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Atkore Unistrut]
 - b. [Cooper B-line; brand of Eaton, Electrical Sector]
 - c. [Hilti, Inc.]
 - d. [Mason Industries, Inc.]
 - e. [Powers Fasteners]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Atkore Unistrut]
 - b. [Cooper B-line; brand of Eaton, Electrical Sector]
 - c. [Hilti, Inc.]
 - d. [Mason Industries, Inc.]
 - e. [Powers Fasteners]
 - f. <Insert manufacturer's name>
3. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
3. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

C. Provide post-installed concrete anchors that have been prequalified for use in wind-load applications. Post-installed concrete anchors must comply with all requirements of **[ASCE/SEI 7-05, Ch. 13][ASCE/SEI 7-10, Ch. 13][ASCE/SEI 7-16, Ch. 13]**.

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

D. Expansion-type anchor bolts are not permitted for equipment in excess of **10 hp (7.46 kW)** that is not vibration isolated.

1. Undercut expansion anchors are permitted.

2.11 CONCRETE INSERTS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Atkore Unistrut]**
2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
3. **[Hilti, Inc.]**
4. **[Mason Industries, Inc.]**



5. [Powers Fasteners]
6. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Atkore Unistrut]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Hilti, Inc.]
4. [Mason Industries, Inc.]
5. [Powers Fasteners]
6. <Insert manufacturer's name>

C. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.

D. Comply with ANSI/MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation[**and wind-force-restraint**] devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by [an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction].
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to high wind forces.
- C. Strength of Support and Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry static and wind load within specified loading limits.

3.3 INSTALLATION OF VIBRATION-CONTROL AND WIND-LOAD-RESTRAINT DEVICES

- A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Fire-Suppression Vibration Isolation [**and Wind-Load-Restraints**]Schedule, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.

- B. Provide wind-load-restraint devices for systems and equipment where indicated in Equipment Schedules or Vibration Isolation **[and Wind-Load-Restraints]** Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
- C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- D. Installation of vibration isolators **[and wind-load restraints]** must not cause any stresses, misalignment, or change of position of equipment or piping.
- E. Comply with requirements in Section 077200 "Roof Accessories" for installation of equipment supports and roof penetrations.
- F. Equipment Restraints:
 - 1. Install snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds **0.125 inch (3.2 mm)**.
- G. Piping Restraints:
 - 1. Comply with all requirements in NFPA 13.
 - 2. Design piping sway bracing according to NFPA 13.
 - a. Maximum spacing of all sway bracing to be no greater than indicated in NFPA 13.
 - b. Design loading of all sway bracing not to exceed values indicated in NFPA 13.
- H. Install wind-load-restraint devices using methods approved by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]** that provides required submittals for component.
- I. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- J. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- K. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- L. Post-Installed Concrete Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL STRUCTURAL MOTION

- A. Install flexible connections in piping where they cross structural construction joints and other points where differential movement may occur, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211000 "Water-Based Fire-Suppression Systems" for piping flexible connections.

3.5 ADJUSTING

- A. Adjust isolators after system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test at no fewer than **[four]<Insert number>** of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Units will be considered defective if they do not pass tests and inspections.



- F. Prepare test and inspection reports.

END OF SECTION 21 05 48 13



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Task	Specification	Specification Description
21 05 48 13	21 05 48 00	Vibration And Seismic Controls For Fire-Suppression Piping And Equipment



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SECTION 21 05 53 00 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Warning tape
4. Pipe labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.
- D. Valve-numbering scheme.
- E. Valve Schedules: Provide for fire-suppression piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Brady Corporation]**
 - b. **[Carlton Industries, LP]**
 - c. **[Champion America]**
 - d. **[Craftmark Pipe Markers]**
 - e. **[emedco]**
 - f. **[Kolbi Pipe Marker Co.]**
 - g. **[LEM Products Inc.]**

- h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
 3. Material and Thickness: [Brass, 0.032 inch (0.8 mm)][stainless steel, 0.025 inch (0.64 mm)][aluminum, 0.032 inch (0.8 mm)][anodized aluminum, 0.032 inch (0.8 mm)] thick, with predrilled or stamped holes for attachment hardware.
 4. Letter and Background Color: As indicated for specific application under Part 3.
 5. Minimum Label Size: Length and width vary for required label content, but not less than **2-1/2 by 3/4 inch (64 by 19 mm)**.
 6. Minimum Letter Size: **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances of up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
3. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, [1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension> thick, with predrilled holes for attachment hardware.
 4. Letter and Background Color: As indicated for specific application under Part 3.
 5. Maximum Temperature: Able to withstand temperatures of up to **160 deg F (71 deg C)**.
 6. Minimum Label Size: Length and width vary for required label content, but not less than **2-1/2 by 3/4 inch (64 by 19 mm)**.
 7. Minimum Letter Size: **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances of up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 8. Fasteners: Stainless steel rivets or self-tapping screws.
 9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. [Brady Corporation]
 2. [Carlton Industries, LP]
 3. [Champion America]
 4. [Craftmark Pipe Markers]
 5. [emedco]
 6. [LEM Products Inc.]
 7. [Marking Services Inc.]
 8. [National Marker Company]
 9. [Pipemarker.com; Brimar Industries, Inc.]
 10. [Seton Identification Products; a Brady Corporation company]
 11. [Stranco, Inc.]
 12. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. [Brady Corporation]

2. [Carlton Industries, LP]
3. [Champion America]
4. [Craftmark Pipe Markers]
5. [emedco]
6. [LEM Products Inc.]
7. [Marking Services Inc.]
8. [National Marker Company]
9. [Pipemarker.com; Brimar Industries, Inc.]
10. [Seton Identification Products; a Brady Corporation company]
11. [Stranco, Inc.]
12. <Insert manufacturer's name>

- C. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, [1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension> thick, with predrilled holes for attachment hardware.
- D. Letter and Background Color: As indicated for specific application under Part 3.
- E. Maximum Temperature: Able to withstand temperatures of up to **160 deg F (71 deg C)**.
- F. Minimum Label Size: Length and width vary for required label content, but not less than **2-1/2 by 3/4 inch (64 by 19 mm)**.
- G. Minimum Letter Size: **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances of up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- H. Fasteners: Stainless steel rivets or self-tapping screws.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E[, **and other applicable codes and standards**].
- K. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 WARNING TAPE

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Brady Corporation]
 2. [Craftmark Pipe Markers]
 3. [National Marker Company]
 4. [Pipemarker.com; Brimar Industries, Inc.]
 5. [Seton Identification Products; a Brady Corporation company]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Brady Corporation]
 2. [Craftmark Pipe Markers]

3. [National Marker Company]
4. [Pipemarker.com; Brimar Industries, Inc.]
5. [Seton Identification Products; a Brady Corporation company]
6. <Insert manufacturer's name>

- C. Material: Vinyl.
- D. Minimum Thickness: **0.005 inch (0.12 mm)**.
- E. Letter, Pattern, and Background Color: As indicated for specific application under Part 3.
- F. Waterproof Adhesive Backing: Suitable for indoor or outdoor use.
- G. Maximum Temperature: **160 deg F (70 deg C)**.
- H. Minimum Width: [**2 inches (50 mm)**][**4 inches (100 mm)**].

2.4 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]
2. [Brady Corporation]
3. [Carlton Industries, LP]
4. [Champion America]
5. [Craftmark Pipe Markers]
6. [emedco]
7. [Kolbi Pipe Marker Co.]
8. [LEM Products Inc.]
9. [Marking Services Inc.]
10. [Pipemarker.com; Brimar Industries, Inc.]
11. [Seton Identification Products; a Brady Corporation company]
12. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]
2. [Brady Corporation]
3. [Carlton Industries, LP]
4. [Champion America]
5. [Craftmark Pipe Markers]
6. [emedco]
7. [Kolbi Pipe Marker Co.]
8. [LEM Products Inc.]
9. [Marking Services Inc.]
10. [Pipemarker.com; Brimar Industries, Inc.]
11. [Seton Identification Products; a Brady Corporation company]
12. <Insert manufacturer's name>

- C. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.



- D. Letter and Background Color: As indicated for specific application under Part 3.
- E. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to **[partially cover][cover full]** circumference of pipe and to attach to pipe without fasteners or adhesive.
- F. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- G. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:
 - 1. Pipe size.
 - 2. Flow-Direction Arrows: Include flow-direction arrows on **[main]** distribution piping. Arrows may be either integral with label or applied separately.
 - 3. Lettering Size: **[Size letters in accordance with ASME A13.1 for piping][At least 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances].**

2.5 STENCILS

- A. Stencils for Piping:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Craftmark Pipe Markers]**
 - b. **[Kolbi Pipe Marker Co.]**
 - c. **[Marking Services Inc.]**
 - d. **[Pipemarker.com; Brimar Industries, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Craftmark Pipe Markers]**
 - b. **[Kolbi Pipe Marker Co.]**
 - c. **[Marking Services Inc.]**
 - d. **[Pipemarker.com; Brimar Industries, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 3. Lettering Size: **[Size letters in accordance with ASME A13.1 for piping][At least 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances].**
 - 4. Stencil Material: Aluminum, brass, or fiberboard.
 - 5. Stencil Paint: Exterior, gloss, **[alkyd enamel][acrylic enamel]<Insert paint type>**. Paint may be in pressurized spray-can form.
 - 6. Identification Paint: Exterior, **[alkyd enamel][acrylic enamel]<Insert paint type>**. Paint may be in pressurized spray-can form.
 - 7. Letter and Background Color: As indicated for specific application under Part 3.

2.6 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]**
 2. **[Brady Corporation]**
 3. **[Carlton Industries, LP]**
 4. **[Champion America]**
 5. **[Craftmark Pipe Markers]**
 6. **[emedco]**
 7. **[Kolbi Pipe Marker Co.]**
 8. **[LEM Products Inc.]**
 9. **[Marking Services Inc.]**
 10. **[Pipemarker.com; Brimar Industries, Inc.]**
 11. **[Seton Identification Products; a Brady Corporation company]**
 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]**
 2. **[Brady Corporation]**
 3. **[Carlton Industries, LP]**
 4. **[Champion America]**
 5. **[Craftmark Pipe Markers]**
 6. **[emedco]**
 7. **[Kolbi Pipe Marker Co.]**
 8. **[LEM Products Inc.]**
 9. **[Marking Services Inc.]**
 10. **[Pipemarker.com; Brimar Industries, Inc.]**
 11. **[Seton Identification Products; a Brady Corporation company]**
 12. **<Insert manufacturer's name>**
- C. Description: Stamped or engraved with **1/4-inch (6.4-mm)** letters for piping-system abbreviation and **1/2-inch (13-mm)** numbers.
1. Tag Material: **[Brass, 0.04 inch (1.0 mm)][stainless steel, 0.024 inch (0.61 mm)][aluminum, 0.031 inch (0.79 mm)][or][anodized aluminum, 0.031 inch (0.79 mm)]** thick, with predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass **[wire][link chain][beaded chain][or][S-hook]**.
- D. Letter and Background Color: As indicated for specific application under Part 3.
- E. Valve Schedules: For each piping system, on **8-1/2-by-11-inch (A4)** bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Include valve-tag schedule in operation and maintenance data.

2.7 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**



products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Brady Corporation]
2. [Champion America]
3. [Craftmark Pipe Markers]
4. [emedco]
5. [Kolbi Pipe Marker Co.]
6. [LEM Products Inc.]
7. [Marking Services Inc.]
8. [Pipemarker.com; Brimar Industries, Inc.]
9. [Seton Identification Products; a Brady Corporation company]
10. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Brady Corporation]
2. [Champion America]
3. [Craftmark Pipe Markers]
4. [emedco]
5. [Kolbi Pipe Marker Co.]
6. [LEM Products Inc.]
7. [Marking Services Inc.]
8. [Pipemarker.com; Brimar Industries, Inc.]
9. [Seton Identification Products; a Brady Corporation company]
10. <Insert manufacturer's name>

C. Description: Preprinted[or partially preprinted,] accident-prevention tags, of plasticized card stock[with matte finish suitable for writing].

1. Size: [3 by 5-1/4 inches (75 by 133 mm) minimum][Approximately 4 by 7 inches (100 by 178 mm)]<Insert dimensions>.
2. Fasteners: [Brass grommet and wire][Reinforced grommet and wire or string].
3. Nomenclature: Large-size primary caption, such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.
- B. Coordinate installation of identifying devices with locations of access panels and doors.

- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

- A. Permanently fasten labels on each item of fire-suppression equipment.
- B. Sign and Label Colors:
 - 1. **[White letters on an ANSI Z535.1 safety-red background]<Insert colors>.**
- C. Locate equipment labels where accessible and visible.
- D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where arc-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E[, **and other applicable codes and standards**].

3.4 INSTALLATION OF WARNING TAPE

- A. Warning Tape Color and Pattern: **[Yellow background with black diagonal stripes]<Insert color, marking pattern, text>.**
- B. Install warning tape on pipes and ducts, with cross-designated walkways providing less than **6 ft. (2 m)** of clearance.
- C. Locate tape so as to be readily visible from the point of normal approach.

3.5 INSTALLATION OF PIPE LABELS

- A. Piping Color Coding: Painting of piping is specified in **[Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]**
- B. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- C. Stenciled Pipe-Label Option: Stenciled labels showing service and flow direction may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, **[with painted, color-coded bands or rectangles]** on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- D. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Within **3 ft. (1 m)** of each valve and control device.
 - 2. At access doors, manholes, and similar access points that permit a view of concealed piping.
 - 3. Within **3 ft. (1 m)** of equipment items and other points of origination and termination.
 - 4. Spaced at maximum intervals of **[25 ft. (8 m)]<Insert dimension>** along each run. Reduce intervals to **[10 ft. (3 m)]<Insert dimension>** in areas of congested piping and equipment.

- E. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- F. Fire-Suppression Pipe Label Color Schedule:
 - 1. Fire-Suppression Pipe Labels: **[White letters on an ANSI Z535.1 safety-red background]<Insert colors>**.

3.6 INSTALLATION OF VALVE TAGS

- A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule in the operating and maintenance manual. Include the identification "FSV" on all fire-suppression system valve tags.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below.
 - 1. Valve-Tag Size and Shape:
 - a. Fire-Suppression Standpipe: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - b. Wet-Pipe Sprinkler System: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - c. Dry-Pipe Sprinkler System: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - d. Foam-Water System: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - e. Clean-Agent Fire-Extinguishing System: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - f. Preaction System: **[1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>**.
 - 2. Valve-Tag Color: **[White letters on an ANSI Z535.1 safety-red background]<Insert colors>**.

3.7 INSTALLATION OF WARNING TAGS

- A. Warning Tag Color: **[Black letters on an ANSI Z535.1 safety-yellow background]<Insert color>**.
- B. Attach warning tags, with proper message, to equipment and other items where **[indicated on Drawings][scheduled]**.

END OF SECTION 21 05 53 00

SECTION 21 07 00 00 - FIRE-SUPPRESSION SYSTEMS INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Calcium silicate fire-suppression system insulation.
2. Cellular glass fire-suppression system insulation.
3. Flexible elastomeric fire-suppression system insulation.
4. Glass-fiber fire-suppression system insulation.
5. Mineral wool fire-suppression system insulation.
6. Phenolic fire-suppression system insulation.
7. Polyisocyanurate fire-suppression system insulation.
8. Polyolefin fire-suppression system insulation.
9. Insulating cements.
10. Insulation adhesives.
11. Insulation mastics and coatings.
12. Insulation sealants.
13. Field-applied insulation jackets.
14. Field-applied fabric-reinforcing mesh for insulation.
15. Field-applied cloths for insulation.
16. Vapor-retarder tapes.
17. Insulation securements.
18. Insulation corner angles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

1. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
3. Detail attachment and covering of heat tracing inside insulation.
4. Detail insulation application at pipe expansion joints for each type of insulation.
5. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
6. Detail removable insulation at piping specialties and equipment connections.
7. Detail application of field-applied jackets.
8. Detail application at linkages of control devices.
9. Detail field application for fire-suppression water storage tanks.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: **12 inches (300 mm) long by NPS 2 (DN 50).**

2. Sheet Form Insulation Materials: **12 inches (300 mm)** square.
3. Jacket Materials for Pipe: **12 inches (300 mm)** long by **NPS 2 (DN 50)**.
4. Sheet Jacket Materials: **12 inches (300 mm)** square.
5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

D. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- B. Field Quality Control Reports: For specified tests and inspections.
- C. Qualification Statements: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program [, **certified by the Department of Labor, Bureau of Apprenticeship and Training**] .

1.5 MOCKUPS

- A. Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
 1. Piping Mockups:
 - a. One **10-ft. (3-m)** section of **NPS 2 (DN 50)** straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One **NPS 2 (DN 50)** or smaller valve, and one **NPS 2-1/2 (DN 65)** or larger valve.
 - e. Four support hangers, including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 - j. One union.
 2. Equipment Mockups:

- a. One tank or vessel.
 3. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 4. Notify Architect [**seven**]**<Insert number>** days in advance of dates and times when mockups will be constructed.
 5. Obtain Architect's approval of mockups before starting insulation application.
 6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. Demolish and remove mockups when directed.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Packaging: Insulation system materials are to be delivered to Project site in unopened containers. The packaging is to include name of manufacturer, fabricator, type, description, and size [, **as well as ASTM standard designation, and maximum use temperature**] .
- 1.7 COORDINATION
- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 210529 "Hangers and Supports for Fire-Suppression Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and with equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.
- 1.8 SCHEDULING
- A. Schedule insulation application after pressure testing systems [**and after installing and testing heat tracing**] . Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. All Insulation Installed Indoors; Outdoors-Installed Insulation in Contact with Airstream: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 3. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-

developed index of 50 or less.

2.2 FIRE-SUPPRESSION SYSTEM INSULATION MATERIALS, GENERAL

- A. Comply with requirements in "Diesel Fire Pump Engine Exhaust Insulation Schedule"; "Fire-Suppression Equipment Insulation Schedule"; "Fire-Suppression System Piping Insulation Schedule, General"; "Indoor Fire-Suppression System Piping Insulation Schedule"; and "Outdoor, Aboveground Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products are not to contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel are to have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.
- E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

2.3 CALCIUM SILICATE FIRE-SUPPRESSION SYSTEM INSULATION

- A. Pipe Insulation - Calcium Silicate, Preformed:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[TPS Industrial; a trademark of Chase Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[TPS Industrial; a trademark of Chase Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 3. Description: ASTM C533, flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement, Type I.
 - 4. Standard: ASTM C533, Type I.
 - 5. Prefabricated Fitting Covers: ASTM C450 and ASTM C585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.4 CELLULAR GLASS FIRE-SUPPRESSION SYSTEM INSULATION

- A. Pipe Insulation - Cellular Glass, Preformed:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Owens Corning]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Owens Corning]
 - b. <Insert manufacturer's name>
3. Description: Cellular-glass insulation of inorganic, incombustible, foamed, or cellulated glass with annealed, rigid, hermetically sealed cells.
4. Standard: ASTM C552.
5. Block Insulation: Type I.
6. Special-Shaped Insulation: Type III.
7. Board Insulation: Type IV.
8. Factory-fabricate shapes in accordance with ASTM C450, ASTM C585, and ASTM C1639.
9. Without Insulation Facing: Type II, Class 1.
10. Factory-Applied Insulation Facing: Type II, Class 2.
- a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
 - c. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.5 FLEXIBLE ELASTOMERIC FIRE-SUPPRESSION SYSTEM INSULATION

A. Pipe Insulation - Flexible Elastomeric:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Aeroflex USA]
 - b. [Armacell LLC]
 - c. [K-Flex USA]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Aeroflex USA]
 - b. [Armacell LLC]
 - c. [K-Flex USA]

d. <Insert manufacturer's name>

3. Description: Closed-cell or expanded-rubber flexible elastomeric pipe insulation.
4. Standard: ASTM C534/C534M, Type I, for tubular materials; Type II for sheet materials.
5. Suitable for maximum use temperature between minus 70 and plus 220 deg F (minus 57 and plus 104 deg C).

2.6 GLASS-FIBER FIRE-SUPPRESSION SYSTEM INSULATION

A. Equipment Insulation - Glass-Fiber Board:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [Knauf Insulation]
 - d. [Manson Insulation Inc.]
 - e. [Owens Corning]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [Knauf Insulation]
 - d. [Manson Insulation Inc.]
 - e. [Owens Corning]
 - f. <Insert manufacturer's name>
3. Description: Glass-fiber board equipment insulation consisting of glass fibers bonded with a thermosetting resin.
4. Standard: ASTM C612, Type IA or Type IB.
5. Suitable for maximum use temperature between 35 and 250 deg F (1.7 and 121 deg C) for jacketed and between 35 and 450 deg F (1.7 and 232 deg C) for unfaced in accordance with ASTM C411.
6. Unfaced.
7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type III.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.

B. Pipe Insulation - Glass-Fiber, Preformed:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Johns Manville; a Berkshire Hathaway company]
 - b. [Knauf Insulation]
 - c. [Manson Insulation Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Johns Manville; a Berkshire Hathaway company]
 - b. [Knauf Insulation]
 - c. [Manson Insulation Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
 3. Description: Glass fibers bonded with a thermosetting resin.
 4. Suitable for maximum use temperature up to **850 deg F (454 deg C)** in accordance with ASTM C411. Comply with ASTM C547.
 5. Preformed Pipe Insulation: Type I, Grade A.
 6. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 7. Unfaced.
 8. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
 - c. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.
- C. Pipe Insulation - Glass-Fiber, Pipe and Tank:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [Knauf Insulation]
 - d. [Manson Insulation Inc.]
 - e. [Owens Corning]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CertainTeed; SAINT-GOBAIN]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [Knauf Insulation]
 - d. [Manson Insulation Inc.]

- e. [Owens Corning]
 - f. <Insert manufacturer's name>
- 3. Description: Glass fibers bonded with a thermosetting resin.
 - 4. Standard: ASTM C1393.
 - 5. Suitable for maximum use temperature between **35 and 850 deg F (1.7 and 454 deg C)**, in accordance with ASTM C411.
 - 6. Semirigid board material.
 - 7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - c. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.7 MINERAL WOOL FIRE-SUPPRESSION SYSTEM INSULATION

A. Pipe Insulation - Mineral Wool, Preformed:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. [Johns Manville; a Berkshire Hathaway company]
 - b. [Owens Corning]
 - c. [ROCKWOOL]
 - d. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Johns Manville; a Berkshire Hathaway company]
 - b. [Owens Corning]
 - c. [ROCKWOOL]
 - d. <Insert manufacturer's name>
- 3. Description: Mandrel-wound mineral wool fibers bonded with a thermosetting resin, unfaced; suitable for maximum use temperature up to **1200 deg F (650 deg C)** in accordance with ASTM C447. Comply with ASTM C547.
- 4. Standard: ASTM C547.
- 5. Preformed Pipe Insulation: Type II, Grade A.
- 6. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
- 7. Unfaced.
- 8. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.

- b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
- c. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
- d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

B. Pipe Insulation - Mineral Wool, Pipe and Tank:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
- 3. Description: Mineral wool fibers bonded with a thermosetting resin.
- 4. Standard: ASTM C1393.
- 5. Suitable for maximum use temperature up to **1000 deg F (538 deg C)**, in accordance with ASTM C411.
- 6. Semirigid board material.
- 7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - c. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.8 PHENOLIC FIRE-SUPPRESSION SYSTEM INSULATION

A. Pipe Insulation - Phenolic:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Kingspan Tarec Industrial Insulation NV]**
 - c. **[Polyguard Products, Inc.]**
 - d. **[Resolco Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Kingspan Tarec Industrial Insulation NV]**
 - c. **[Polyguard Products, Inc.]**
 - d. **[Resolco Inc.]**
 - e. **<Insert manufacturer's name>**
3. Description: Prefabricated phenolic pipe insulation of rigid, expanded, closed-cell structure.
4. Standard: ASTM C1126.
5. Prefabricated Pipe Insulation: Type III.
6. Prefabricated shapes in accordance with ASTM C450 and ASTM C585.
7. Unfaced.
8. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ+: Aluminum-foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - c. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.9 POLYISOCYANURATE FIRE-SUPPRESSION SYSTEM INSULATION**A. Pipe Insulation - Polyisocyanurate:**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Duna USA Inc.]**
 - b. **[Dyplast Products]**
 - c. **[Johns Manville; a Berkshire Hathaway company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Duna USA Inc.]**
 - b. **[Dyplast Products]**
 - c. **[Johns Manville; a Berkshire Hathaway company]**
 - d. **<Insert manufacturer's name>**

3. Description: Prefabricated, rigid cellular polyisocyanurate pipe insulation intended for use as thermal insulation.
4. Standard: ASTM C591.
5. Type IV, except thermal conductivity (k-value) to not exceed **0.19 Btu x in./h x sq. ft. x deg F (0.027 W/m x K) at 75 deg F (24 deg C)** after 180 days of aging.
6. Flame-spread index is to be 25 or less and smoke-developed index is to be 50 or less for thickness up to **1-1/2 inches (38 mm)** as tested in accordance with ASTM E84.
7. Fabricate shapes in accordance with ASTM C450 and ASTM C585.
8. Unfaced.
9. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.10 POLYOLEFIN FIRE-SUPPRESSION SYSTEM INSULATION

A. Pipe Insulation - Polyolefin:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Armacell LLC]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armacell LLC]**
 - b. **<Insert manufacturer's name>**
3. Description: Polyethylene type of polyolefin thermal plastic insulation.
4. Standard: ASTM C1427, Type I, Grade 1, for tubular materials and with Type II, Grade 1, for sheet materials [, **self-seal**] .

2.11 INSULATING CEMENTS

A. Insulating Cement for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Ramco Insulation, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Ramco Insulation, Inc.]**
- b. **<Insert manufacturer's name>**

3. Standard: ASTM C195.

B. Insulating Cement for Expanded or Exfoliated Vermiculite:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Ramco Insulation, Inc.]**
- b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Ramco Insulation, Inc.]**
- b. **<Insert manufacturer's name>**

3. Standard: ASTM C196.

C. Hydraulic-Setting Insulating and Finishing Cement for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Ramco Insulation, Inc.]**
- b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Ramco Insulation, Inc.]**
- b. **<Insert manufacturer's name>**

3. Standard: ASTM C449.

2.12 INSULATION ADHESIVES

- A. Materials are to be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Insulation Adhesive for Lagging Cloth:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

following] :

- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Vimasco Corporation]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Vimasco Corporation]
 - d. <Insert manufacturer's name>
3. Standard: MIL-A-3316C, Class I, Grade A.
4. Adhesives to be compatible with insulation materials, jackets, and substrates.
5. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
6. Service Temperature Range: [20 to plus 180 deg F (Minus 6 to plus 82 deg C)][0 to plus 180 deg F (Minus 18 to plus 82 deg C)] .
7. Color: White.
8. Verify adhesive is as recommended by insulation manufacturer and has a VOC content of [50]<Insert number> g/L or less.

C. Insulation Adhesive for Calcium Silicate:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Vimasco Corporation]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Vimasco Corporation]
 - e. <Insert manufacturer's name>
3. Description: Fibrous, sodium-silicate-based adhesive with a service temperature range of **50 to 800 deg F (10 to 427 deg C)**.
4. Adhesive: As recommended by adhesive manufacturer and with a VOC content of 80 g/L or less.

D. Insulation Adhesive for Cellular-Glass:

1. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Childers Brand; H. B. Fuller Construction Products]
- b. [Foster Brand; H. B. Fuller]
- c. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Childers Brand; H. B. Fuller Construction Products]
- b. [Foster Brand; H. B. Fuller]
- c. <Insert manufacturer's name>

- 3. Description: Two-component, thermosetting urethane containing no flammable solvent, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).
- 4. Adhesive: As recommended by cellular-glass manufacturer and with a VOC content of 80 g/L or less.

E. Insulation Adhesive, Solvent Based for Flexible Elastomeric and Polyolefin:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Aeroflex USA]
- b. [Armacell LLC]
- c. [Foster Brand; H. B. Fuller]
- d. [K-Flex USA]
- e. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Aeroflex USA]
- b. [Armacell LLC]
- c. [Foster Brand; H. B. Fuller]
- d. [K-Flex USA]
- e. <Insert manufacturer's name>

- 3. Description: Solvent-based adhesive for flexible elastomeric and polyolefin insulation.
- 4. Flame-spread index is to be 25 or less and smoke-developed index is to be 50 or less as tested in accordance with ASTM E84.
- 5. Wet Flash Point: Below 0 deg F (minus 18 deg C).
- 6. Service Temperature Range: 40 to 200 deg F (4 to plus 93 deg C).
- 7. Color: [Black]<Insert color> .
- 8. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of [80]<Insert value> g/L or less.

F. Insulation Adhesive for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 3. Standard: MIL-A-3316C, Class 2, Grade A.
 4. Adhesive: As recommended by mineral-fiber manufacturer and with a VOC content of 80 g/L or less.
 5. Verify fiberglass adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).
- G. Insulation Adhesive - for Phenolic and Polyisocyanurate:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 3. Description: Solvent-based resin adhesive, with a service temperature range of **minus 75 to plus 300 deg F (minus 59 to plus 149 deg C)**.
- H. Adhesive: As recommended by phenolic and polyisocyanate manufacturer and with a VOC content of 50 g/L or less.
- I. Insulation Adhesive for ASJ, FSK, and PVDC Facings/Jackets:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Childers Brand; H. B. Fuller Construction Products]**
- b. **[Foster Brand; H. B. Fuller]**
- c. **[Mon-Eco Industries, Inc.]**
- d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Childers Brand; H. B. Fuller Construction Products]**
- b. **[Foster Brand; H. B. Fuller]**
- c. **[Mon-Eco Industries, Inc.]**
- d. **<Insert manufacturer's name>**

3. Description: Insulation adhesive for bonding ASJ, FSK, and PVDC facing/jacket insulation lap seams and joints.
4. Standard: MIL-A-3316C, Class 2, Grade A.
5. Verify adhesives have a VOC content of 80 g/L or less.
6. Verify adhesives have a VOC content of 80 g/L or less.

J. Insulation Adhesive for PVC Jackets:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. **[Johns Manville; a Berkshire Hathaway company]**
- b. **[P.I.C. Plastics, Inc.]**
- c. **[Proto Corporation]**
- d. **[Sekisui Voltek, LLC]**
- e. **[Speedline Corporation]**
- f. **[The Dow Chemical Company]**
- g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
- b. **[P.I.C. Plastics, Inc.]**
- c. **[Proto Corporation]**
- d. **[Sekisui Voltek, LLC]**
- e. **[Speedline Corporation]**
- f. **[The Dow Chemical Company]**
- g. **<Insert manufacturer's name>**

3. Description: PVC jacket adhesive to be compatible with and as recommended in PVC jacket manufacturer's literature.
4. Adhesive: As recommended by PVC jacket manufacturer and with a VOC content of 50 g/L or less.

2.13 INSULATION MASTICS AND COATINGS

- A. Materials are to be compatible with insulation materials, jackets, and substrates.
1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
 2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.
- B. Insulation Vapor-Retarder Mastic - Water Based, Indoor Use:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
 3. Description: Insulation vapor-retarder mastic, water based, and suitable for indoor use on below-ambient services.
 4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
 6. Standard: MIL-PRF-19565C, Type II, for permeance requirements **[, with supplier listing on DOD's Qualified Products Database]** .
 7. Color: **[White]<Insert color>** .
- C. Insulation Vapor-Retarder Mastic - Solvent Based, Indoor Use:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Childers Brand; H. B. Fuller Construction Products]**
- b. **[Foster Brand; H. B. Fuller]**
- c. **[Mon-Eco Industries, Inc.]**
- d. **<Insert manufacturer's name>**

3. Description: Insulation vapor-retarder mastic, solvent based, and suitable for indoor use on below-ambient services.
4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
5. Service Temperature Range: **Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).**
6. Color: **[White]<Insert color>** .

D. Insulation Breather Mastic - Water Based, Indoor/Outdoor:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
3. Description: Insulation breather mastic, water based, and suitable for indoor and outdoor use on above-ambient surfaces.
4. Water-Vapor Permeance: ASTM E96/E96M, greater than **1.0 perm (0.66 metric perm)** at manufacturer's recommended dry film thickness.
5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
6. Color: **[White]<Insert color>** .

2.14 INSULATION SEALANTS

A. Insulation Joint Sealant:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :

- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
 3. Permanently flexible, elastomeric sealant.
 4. Service Temperature Range: [Minus 150 to plus 250 deg F (Minus 101 to plus 121 deg C)][Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C)] .
 5. Color: White or gray.
 6. Verify sealant has a VOC content of 420 g/L or less.
- B. Flashing Sealant for FSK and Metal Jackets:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. <Insert manufacturer's name>
 3. Flashing sealant to be compatible with insulation materials, jackets, and substrates.
 4. Fire- and water-resistant, flexible, elastomeric sealant.
 5. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 6. Color: Aluminum.
 7. Verify sealant has a VOC content of 420 g/L or less.
- C. Flashing Sealant for ASJ and PVC Jackets:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
3. Flashing sealant to be compatible with insulation materials, jackets, and substrates.
4. Fire- and water-resistant, flexible, elastomeric sealant.
5. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).**
6. Color: White.
7. Verify sealant has a VOC content of 420 g/L or less.

2.15 FIELD-APPLIED INSULATION JACKETS

- A. Field-applied jackets are to comply with ASTM C1136, Type I unless otherwise indicated.
- B. Insulation Jacket, Field Applied - FSK:
 1. Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Insulation Jacket, Field Applied - PVC: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Airex Manufacturing Inc.]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[P.I.C. Plastics, Inc.]**
 - d. **[Proto Corporation]**
 - e. **[Speedline Corporation]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Airex Manufacturing Inc.]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[P.I.C. Plastics, Inc.]**
 - d. **[Proto Corporation]**
 - e. **[Speedline Corporation]**
 - f. **<Insert manufacturer's name>**
 3. Description: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-

- C.
 - 4. Thickness: As indicated in "Outdoor, Field-Applied Insulation Jacket Schedule" Article.
 - 5. Jacket: Roll stock ready for shop or field cutting and forming.
 - 6. Adhesive: As recommended by jacket material manufacturer.
 - 7. Color: **[White][Color-code jackets based on system. Color as selected by Architect]** .
 - 8. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, and end caps.
 - 9. Factory-fabricated tank heads and tank side panels.
- D. Insulation Jacket, Field Applied - Metal:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
 - 3. Jacket Material - Aluminum:
 - a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
 - b. Standard: ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - c. Finish and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" Articles.
 - d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are unavailable.
 - 4. Jacket Material - Stainless Steel:

- a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
- b. Standard: ASTM A240/A240M.
- c. Material Type, Finish, and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" Articles.
- d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick polysurlyn]** .
- e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick polysurlyn]** .
- f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are unavailable.

E. Insulation Jacket, Field Applied - Outdoor, Self Adhesive (Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Description: Self-adhesive outdoor asphaltic jacket of rubberized bituminous resin on a cross-laminated polyethylene film covered with **[white][stucco-embossed]** aluminum-foil.
4. Vapor Barrier/Waterproofing Membrane: **60-mil (1.5-mm)** thickness.

F. Insulation Jacket, Field Applied - Indoor/Outdoor Self Adhesive (Non-Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**
3. Description: Vapor barrier and waterproofing jacket for installation over insulation located aboveground outdoors or indoors.
4. Specialized jacket consisting of five layers of laminated aluminum and polyester film.
5. Adhesive Lap: Self-adhesive, low-temperature acrylic, pressure-sensitive adhesive lap.
6. Permeance: 0.00 perm as tested in accordance with ASTM F1249.
7. Flame Spread/Smoke Developed: 25/50 as tested in accordance with ASTM E84.
8. Aluminum Finish: **[Embossed][Smooth]** .
9. Outer Aluminum Surface: Coated with UV-resistant coating for protection from environmental contaminants.

2.16 FIELD-APPLIED FABRIC-REINFORCING MESH FOR INSULATION

A. Woven Glass-Fiber Fabric for Fire-Suppression System Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **<Insert manufacturer's name>**
3. Description: Woven glass-fiber fabric for covering pipe and pipe fittings insulation.
4. Weight: Approximately **4 oz./sq. yd. (114 g/sq. m)**.
5. Thread Count: **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm)**.

B. Woven Glass-Fiber Fabric for Fire-Suppression System Equipment Insulation:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Childers Brand; H. B. Fuller Construction Products]**
- b. **<Insert manufacturer's name>**

- 3. Description: Woven glass-fiber fabric for covering equipment insulation.
- 4. Weight: Approximately **6 oz./sq. yd. (203 g/sq. m)**.
- 5. Thread Count: **5 strands by 5 strands/sq. in. (2 strands by 2 strands/sq. mm)**.

C. Woven Polyester Fabric for Fire-Suppression System Insulation:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Foster Brand; H. B. Fuller]**
 - b. **[Vimasco Corporation]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foster Brand; H. B. Fuller]**
 - b. **[Vimasco Corporation]**
 - c. **<Insert manufacturer's name>**
- 3. Description: Woven polyester fabric for covering pipe, fittings, and equipment insulation.
- 4. Weight: Approximately **1 oz./sq. yd. (34 g/sq. m)**.
- 5. Thread Count: **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm)**.
- 6. Weave Type: Leno.

2.17 FIELD-APPLIED CLOTHS FOR INSULATION

A. Woven Glass-Fiber Cloth, Field Applied, for Insulation:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**
- 3. Description: Woven glass-fiber cloth.
- 4. Standard: MIL-C-20079H, Type I.
- 5. Weave: Plain.
- 6. Weight: Minimum of **8 oz./sq. yd. (271 g/sq. m)**, presized.

2.18 VAPOR-RETARDER TAPES

- A. Vapor-Retarder Tape for ASJ: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
 3. Description: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
 4. Standard: ASTM C1136.
 5. Width: **[3 inches (75 mm)]<Insert value>** .
 6. Thickness: **[11.5 mils (0.29 mm)]<Insert value>** .
 7. Adhesion: **[90 ounces force/inch (1.0 N/mm)]<Insert value>** in width.
 8. Elongation: **[2]<Insert number>** percent.
 9. Tensile Strength: **[40 lbf/inch (7.2 N/mm)]<Insert value>** in width.
 10. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. Vapor-Retarder Tape for FSK:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**

e. <Insert manufacturer's name>

3. Description: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
4. Standard: ASTM C1136.
5. Width: [3 inches (75 mm)]<Insert value> .
6. Thickness: [6.5 mils (0.16 mm)]<Insert value> .
7. Adhesion: [90 ounces force/inch (1.0 N/mm)]<Insert value> in width.
8. Elongation: [2]<Insert number> percent.
9. Tensile Strength: [40 lbf/inch (7.2 N/mm)]<Insert value> in width.
10. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Vapor-Retarder Tape for PVC:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [3M Industrial Adhesives and Tapes Division]
 - b. [Ideal Tape Co., Inc., an American Biltrite Company]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [3M Industrial Adhesives and Tapes Division]
 - b. [Ideal Tape Co., Inc., an American Biltrite Company]
 - c. <Insert manufacturer's name>
3. Description: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive.
4. Application: Suitable for indoor and outdoor applications.
5. Width: [2 inches (50 mm)]<Insert value> .
6. Thickness: [6 mils (0.15 mm)]<Insert value> .
7. Adhesion: [64 ounces force/inch (0.7 N/mm)]<Insert value> in width.
8. Elongation: [500]<Insert number> percent.
9. Tensile Strength: [18 lbf/inch (3.3 N/mm)]<Insert value> in width.

D. Vapor-Retarder Tape Aluminum Foil:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [3M Industrial Adhesives and Tapes Division]
 - b. [Avery Dennison Corporation, Specialty Tapes Division]
 - c. [Ideal Tape Co., Inc., an American Biltrite Company]
 - d. [Knauf Insulation]
 - e. [Sekisui Voltek, LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [3M Industrial Adhesives and Tapes Division]
 - b. [Avery Dennison Corporation, Specialty Tapes Division]
 - c. [Ideal Tape Co., Inc., an American Biltrite Company]
 - d. [Knauf Insulation]
 - e. [Sekisui Voltek, LLC]
 - f. <Insert manufacturer's name>
3. Description: Aluminum-foil vapor-retarder tape with acrylic adhesive.
 4. Width: [2 inches (50 mm)]<Insert value> .
 5. Thickness: [3.7 mils (0.093 mm)]<Insert value> .
 6. Adhesion: [100 ounces force/inch (1.1 N/mm)]<Insert value> in width.
 7. Elongation: [5]<Insert number> percent.
 8. Tensile Strength: [34 lbf/inch (6.2 N/mm)]<Insert value> in width.

2.19 INSULATION SECUREMENTS

A. Insulation Bands:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Johns Manville; a Berkshire Hathaway company]
 - b. [RPR Products, Inc.]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Johns Manville; a Berkshire Hathaway company]
 - b. [RPR Products, Inc.]
 - c. <Insert manufacturer's name>
3. Insulation Bands - Stainless Steel: ASTM A240/A240M, [Type 304][or][Type 316] ; 0.015 inch (0.38 mm) thick, [1/2 inch (13 mm)][3/4 inch (19 mm)] wide with [wing seal][or][closed seal] .
4. Insulation Bands - Aluminum: ASTM B209 (ASTM B209M); Alloy 3003, 3005, 3105, or 5005; Temper H-14; 0.020 inch (0.51 mm) thick, [1/2 inch (13 mm)][3/4 inch (19 mm)] wide with [wing seal][or][closed seal] .
5. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Insulation Hangers - Metal, Adhesively Attached, Perforated Base:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - 1) [AGM Industries, Inc]
 - 2) [Gemco]
 - 3) [Midwest Fasteners, Inc]

- 4) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [AGM Industries, Inc]
 - 2) [Gemco]
 - 3) [Midwest Fasteners, Inc]
 - 4) <Insert manufacturer's name>
 - c. Description: Baseplate welded to projection spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
 - d. Baseplate: Perforated, galvanized carbon steel sheet, **0.030 inch (0.76 mm)** thick by **2 inches (50 mm)** square.
 - e. Spindle: [**Copper- or zinc-coated, low carbon steel**][Aluminum][Stainless steel] , fully annealed, **0.106-inch- (2.6-mm-)** diameter shank; length to suit depth of insulation indicated.
 - f. Adhesive: Recommended by hanger manufacturer. Use product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
2. Insulation Hangers - Self-Sticking-Base:
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - 1) [AGM Industries, Inc]
 - 2) [Gemco]
 - 3) [Midwest Fasteners, Inc]
 - 4) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [AGM Industries, Inc]
 - 2) [Gemco]
 - 3) [Midwest Fasteners, Inc]
 - 4) <Insert manufacturer's name>
 - c. Description: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
 - d. Baseplate Material: Galvanized carbon steel sheet, **0.030 inch (0.76 mm)** thick by **2 inches (50 mm)** square.
 - e. Spindle: [**Copper- or zinc-coated, low-carbon steel**][Aluminum][Stainless steel] , fully annealed, **0.106-inch- (2.6-mm-)** diameter shank; length to suit depth of insulation indicated.
 - f. Adhesive-backed base with a peel-off protective cover.
3. Insulation Washers - Insulation Retaining:
- a. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- 1) [AGM Industries, Inc]
- 2) [Gemco]
- 3) [Midwest Fasteners, Inc]
- 4) [Nelson Stud Welding]
- 5) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [AGM Industries, Inc]
- 2) [Gemco]
- 3) [Midwest Fasteners, Inc]
- 4) [Nelson Stud Welding]
- 5) <Insert manufacturer's name>

- c. Description: Self-locking washers formed from **0.016-inch- (0.41-mm-)** thick, [galvanized-steel][aluminum][stainless steel] sheet, with beveled edge sized as required to hold insulation securely in place but not less than **1-1/2 inches (38 mm)** in diameter.
- d. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

- C. Insulation Staples: Outward-clinching insulation staples, nominal **3/4 inch (19 mm)** wide, stainless steel or Monel.

- D. Insulation Wire:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [C & F Wire Products]
- b. [Johns Manville; a Berkshire Hathaway company]
- c. [RPR Products, Inc.]
- d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [C & F Wire Products]
- b. [Johns Manville; a Berkshire Hathaway company]
- c. [RPR Products, Inc.]
- d. <Insert manufacturer's name>

3. Description: [0.080-inch (2.0-mm) nickel-copper alloy][0.062-inch (1.6-mm) soft-annealed, stainless steel][0.062-inch (1.6-mm) soft-annealed, galvanized steel] .

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2.20 INSULATION CORNER ANGLES

A. Insulation Corner Angles - PVC:

1. Thickness: **[30 mils (0.8 mm)]<Insert dimension>** .
2. Dimensions: Minimum **1 by 1 inch (25 by 25 mm)**.
3. Material: PVC in accordance with ASTM D1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Insulation Corner Angles - Aluminum:

1. Thickness: **[0.040 inch (1.0 mm)]<Insert dimension>** .
2. Dimensions: Minimum **1 by 1 inch (25 by 25 mm)**.
3. Material: Aluminum in accordance with **ASTM B209 (ASTM B209M)**; Alloy 3003, 3005, 3105, or 5005; Temper H-14.

C. Insulation Corner Angles - Stainless Steel:

1. Thickness: **[0.024 inch (0.61 mm)]<Insert dimension>** .
2. Dimensions: Minimum **1 by 1 inch (25 by 25 mm)**.
3. Material: Stainless steel in accordance with ASTM A240/A240M, **[Type 304][or][Type 316]** .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with epoxy primer **5 mils (0.127 mm)** thick and epoxy finish **5 mils (0.127 mm)** thick if operating in a temperature range of between **140 and 300 deg F (60 and 149 deg C)**. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between **32 and 300 deg F (0 and 149 deg C)** with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements

for heat tracing that apply to insulation.

- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 INSTALLATION OF FIRE-SUPPRESSION SYSTEM INSULATION, GENERAL

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock) of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents [, **unless otherwise approved by engineer of record**] .
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 - 2. Cover circumferential joints with **3-inch- (75-mm-)** wide strips, of same material as insulation

- jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced **4 inches (100 mm)** o.c.
 3. Overlap jacket longitudinal seams at least **1-1/2 inches (38 mm)**. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **[2 inches (50 mm)][4 inches (100 mm)]** o.c.
 4. For below-ambient services, apply vapor-barrier mastic over staples.
 5. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
 6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **4 inches (100 mm)** beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- Q. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.
- R. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using **[prefabricated fitting insulation][or][mitered or routed fittings]** made from same material and density as adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with **[prefabricated fitting insulation][or][sectional pipe insulation]** of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using **[prefabricated fitting insulation][or][sectional pipe insulation]** of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using **[prefabricated fitting insulation][or][sectional pipe insulation]** of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe

- diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- S. Insulate instrument connections for pressure gauges, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- T. Install removable insulation covers [**at locations indicated on Drawings**] . Installation complies with the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least **2 inches (50 mm)** over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least **2 inches (50 mm)** below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least **2 inches (50 mm)**.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations That Are Not Fire Rated: Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF GLASS-FIBER FIRE-SUPPRESSION SYSTEM INSULATION

A. Installation on the following:

1. Straight Pipes and Tubes:

- a. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
- b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and applicable insulation joint sealant.
- c. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
- d. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

2. Pipe Flanges:

- a. Install prefabricated pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral wool blanket insulation.
- d. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.

3. Insulation Installation on Pipe Fittings and Elbows:

- a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
- b. When preformed insulation elbows and fittings are unavailable, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation

materials with wire or bands.

4. Insulation Installation on Valves and Pipe Specialties:

- a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
- b. When prefabricated sections are unavailable, install mitered sections of pipe insulation to valve body.
- c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- d. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF MINERAL WOOL FIRE-SUPPRESSION SYSTEM INSULATION

A. Installation on the following:

1. Straight Pipes and Tubes:

- a. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
- b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
- c. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at **6 inches (150 mm) o.c.**
- d. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

2. Pipe Flanges:

- a. Install prefabricated pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral wool blanket insulation.
- d. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.

3. Pipe Fittings and Elbows:

- a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
- b. When preformed insulation elbows and fittings are unavailable, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

4. Valves and Pipe Specialties:

- a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
- b. When prefabricated sections are unavailable, install mitered sections of pipe insulation to valve body.
- c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- d. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF CALCIUM SILICATE FIRE-SUPPRESSION SYSTEM INSULATION

A. Installation on the following:

1. Straight Pipes and Tubes:

- a. Secure single-layer insulation with stainless steel bands at **12-inch (300-mm)** intervals and tighten bands without deforming insulation materials.
- b. Install two-layer insulation with joints tightly butted and staggered at least **3 inches (75 mm)**. Secure inner layer with wire spaced at **12-inch (300-mm)** intervals. Secure outer layer with stainless steel bands at **12-inch (300-mm)** intervals.
- c. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least **1 inch (25 mm)**. Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.

2. Pipe Flanges:

- a. Install prefabricated pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation. Where voids are difficult to fill with block insulation, fill voids with a fibrous insulation material suitable for specific operating temperature.
- d. Finish flange insulation same as pipe insulation.

3. Pipe Fittings and Elbows:

- a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
- b. When prefabricated insulation sections of insulation are unavailable, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
- c. Finish fittings insulation same as pipe insulation.

4. Valves and Pipe Specialties:

- a. Install pipe insulation, quads, hex sections, or beveled lag segments, adhered together, to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- b. Install insulation to flanges as specified for flange insulation application.
- c. Finish valve and specialty insulation same as pipe insulation.

3.8 INSTALLATION OF CELLULAR-GLASS FIRE-SUPPRESSION SYSTEM INSULATION

A. Installation on the following:

1. Straight Pipes and Tubes:

- a. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
- b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and applicable insulation joint sealant.
- c. For insulation with jackets on above-ambient services, secure laps with outward-clinched

- staples at **6 inches (150 mm)** o.c.
 - d. For insulation with jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
 - 2. Pipe Flanges:
 - a. Install prefabricated pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation. Where voids are difficult to fill with block insulation, fill voids with a fibrous insulation material suitable for specific operating temperature.
 - d. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.
 - 3. Pipe Fittings and Elbows:
 - a. Install prefabricated sections of same material as straight segments of pipe insulation when available.
 - b. When preformed sections of insulation are unavailable, install mitered or routed sections of cellular-glass insulation. Secure insulation materials with wire or bands.
 - 4. Valves and Pipe Specialties:
 - a. Install prefabricated sections of cellular-glass insulation to valve body.
 - b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - c. Install insulation to flanges as specified for flange insulation application.
- 3.9 INSTALLATION OF FLEXIBLE ELASTOMERIC FIRE-SUPPRESSION SYSTEM INSULATION
 - A. Installation on the following:
 - 1. Equipment and Tanks:
 - a. Apply **[100]<Insert number>** percent coverage of adhesive to surface with manufacturer's recommended adhesive.
 - b. Seal longitudinal seams and end joints.
 - 2. Pipe Flanges:
 - a. Install pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - d. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 - 3. Pipe Fittings and Elbows:
 - a. Install sections of pipe insulation and miter if required in accordance with manufacturer's

- written instructions.
- b. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

4. Valves and Pipe Specialties:

- a. Install preformed valve covers manufactured of same material as pipe insulation when available.
- b. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.
- d. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- B. Finish: After adhesive has fully cured, apply two coats of insulation and manufacturer's recommended protective coating.

3.10 INSTALLATION OF PHENOLIC FIRE-SUPPRESSION SYSTEM INSULATION

A. General Installation Requirements:

- 1. Secure single-layer insulation with stainless steel bands at **12-inch (300-mm)** intervals and tighten bands without deforming insulation materials.
- 2. Install two-layer insulation with joints tightly butted and staggered at least **3 inches (75 mm)**. Secure inner layer with **0.062-inch (1.6-mm)** wire spaced at **12-inch (300-mm)** intervals. Secure outer layer with stainless steel bands at **12-inch (300-mm)** intervals.

B. Insulation on the following:

1. Straight Pipes and Tubes:

- a. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
- b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and applicable insulation joint sealant.
- c. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
- d. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

2. Pipe Flanges:

- a. Install prefabricated pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation. Where voids are difficult to fill with block insulation, fill voids with a fibrous insulation material suitable for specific operating temperature.

3. Pipe Fittings and Elbows:

- a. Install prefabricated insulation sections, or mitered or routed fittings, of same material as straight segments of pipe insulation.

4. Valves and Pipe Specialties:

- a. Install preformed insulation sections of same material as straight segments of pipe insulation.
- b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.

3.11 INSTALLATION OF POLYISOCYANURATE FIRE-SUPPRESSION SYSTEM INSULATION

A. Insulation on the following:

1. Straight Pipes and Tubes:

- a. Secure each layer of insulation to pipe with tape or bands and tighten without deforming insulation materials. Orient longitudinal joints between half sections in 3- and 9-o'clock positions on the pipe.
- b. For insulation with jackets with vapor barriers, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive or tape as recommended by insulation material manufacturer and seal with vapor-barrier mastic.
- c. All insulation is tightly butted and free of voids and gaps at all joints. Vapor barrier must be continuous. Before installing jacket material, install vapor-barrier system.

2. Pipe Flanges:

- a. Install preformed pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, same thickness of adjacent pipe insulation, not to exceed **1-1/2-inch (38-mm)** thickness.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyisocyanurate block insulation of same thickness as pipe insulation. Where voids are difficult to fill with block insulation, fill voids with a fibrous insulation material suitable for specific operating temperature.

3. Fittings and Elbows:

- a. Install prefabricated sections of same material as straight segments of pipe insulation.

4. Valves and Pipe Specialties:

- a. Install prefabricated sections of polyisocyanurate insulation to valve body.
- b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.

3.12 INSTALLATION OF POLYOLEFIN FIRE-SUPPRESSION SYSTEM INSULATION

A. Insulation on the following:

1. Straight Pipes and Tubes:
 - a. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive [, or via **self-seal mechanism**] to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Pipe Flanges:
 - a. Install pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
 - d. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
3. Pipe Fittings and Elbows:
 - a. Install mitered sections of polyolefin pipe insulation.
 - b. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
4. Valves and Pipe Specialties:
 - a. Install cut sections of polyolefin pipe and sheet insulation to valve body.
 - b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - c. Install insulation to flanges as specified for flange insulation application.
 - d. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.13 INSTALLATION OF WOVEN GLASS-FIBER CLOTH FOR INSULATION

- A. Where woven glass-fiber cloths are indicated, install directly over bare insulation or insulation with factory-applied facings.
 1. Draw cloths smooth and tight to surface with **2-inch (50-mm)** overlap at seams and joints.
 2. Embed glass cloth between two **0.062-inch- (1.6-mm-)** thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.

3.14 INSTALLATION OF FIELD-APPLIED INSULATION JACKETS

- A. Insulation Jacket, Field-Applied - FSK:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with **1-1/2-inch (38-mm)** laps at longitudinal seams and **3-inch- (75-mm-)** wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Insulation Jacket, Field-Applied - PVC:

1. Install with **1-inch (25-mm)** overlap at longitudinal seams and end joints.
2. Seal with manufacturer's recommended adhesive.
3. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Insulation Jacket, Field-Applied - Metal:

1. Install with **2-inch (50-mm)** overlap at longitudinal seams and end joints.
2. Overlap longitudinal seams arranged to shed water.
3. Seal end joints with weatherproof sealant recommended by insulation manufacturer.
4. Secure jacket with stainless steel bands **12 inches (300 mm)** o.c. and at end joints.

3.15 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in **[Section 099113 "Exterior Painting"]****[Section 099114 "Exterior Painting (MPI Standards)]** and **[Section 099123 "Interior Painting."]****[Section 099124 "Interior Painting (MPI Standards)."]**

1. Flat Acrylic Finish: **[Two]<Insert number>** finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless steel jackets.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]** .

D. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to **[one]<Insert number>** location(s) for each type of equipment defined in the "Fire-Suppression Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to **[three]<Insert number>** locations of straight pipe, **[three]<Insert number>** locations of threaded fittings, **[three]<Insert number>** locations of welded fittings, **[two]<Insert number>** locations of threaded strainers, **[two]<Insert number>** locations of welded strainers,



[three]<Insert number> locations of threaded valves, and [three]<Insert number> locations of flanged valves for each pipe service defined in the "Fire-Suppression System Piping Insulation Schedule, General" Article.

3. All insulation applications will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.17 DIESEL FIRE PUMP ENGINE EXHAUST INSULATION SCHEDULE

A. Indoor and Outdoor, Exposed, Rigid, Engine Exhaust Pipe and Silencer:

1. Pipe Insulation - Calcium Silicate, Preformed: [4 inches (100 mm)]<Insert dimension> thick.

3.18 FIRE-SUPPRESSION EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment that is not factory insulated.

C. Fire-suppression water storage tank insulation is to be one of the following:

1. Fire-Suppression System Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
2. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
3. Equipment Insulation - Glass-Fiber Board: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
4. Pipe Insulation - Glass-Fiber, Pipe and Tank: [1 inch (25 mm)]<Insert dimension> thick.
5. Pipe Insulation - Mineral Wool, Pipe and Tank: [1-1/2 inches (38 mm)]<Insert dimension> thick.
6. Pipe Insulation - Polyisocyanurate: [1 inch (25 mm)]<Insert dimension> thick.
7. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

3.19 FIRE-SUPPRESSION SYSTEM PIPING INSULATION SCHEDULE, GENERAL

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Indoor fire-suppression piping.
2. Underground piping.

3.20 INDOOR FIRE-SUPPRESSION SYSTEM PIPING INSULATION SCHEDULE

A. Indoor Engine Coolant Piping for Remote Radiator of Engine-Driven Fire Pump:

1. All Pipe Sizes: Insulation is to be one of the following:
 - a. Pipe Insulation - Calcium Silicate, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Cellular Glass, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.

B. Indoor Fire Pump Engine Exhaust Piping and Silencer:

1. All Pipe Sizes: Insulation is to be the following:
 - a. Pipe Insulation - Calcium Silicate, Preformed: **[4 inches (100 mm)]<Insert dimension>** thick.

3.21 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Fire-Suppression Water Piping:

1. All Pipe Sizes: Insulation is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - d. Pipe Insulation - Phenolic: **[2 inches (50 mm)]<Insert dimension>** thick.

B. Outdoor Engine Coolant Piping for Remote Radiator of Engine-Driven Fire Pump:

1. All Pipe Sizes: Insulation is to be one of the following:
 - a. Pipe Insulation - Calcium Silicate, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Cellular Glass, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.

C. Outdoor Fire Pump Engine Exhaust Piping and Silencer:

1. All Pipe Sizes: Insulation is to be the following:
 - a. Pipe Insulation - Calcium Silicate, Preformed: **[4 inches (100 mm)]<Insert dimension>** thick.

D. Outdoor Fire-Suppression Piping Filled with Water:

1. All Pipe Sizes: Insulation is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation Flexible Elastomeric: **[2 inches (50 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - e. Pipe Insulation - Phenolic: **[2 inches (50 mm)]<Insert dimension>** thick.
 - f. Pipe Insulation - Polyisocyanurate: **[2 inches (50 mm)]<Insert dimension>** thick.
 - g. Pipe Insulation - Polyolefin: **[2 inches (50 mm)]<Insert dimension>** thick.

3.22 INDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed from View:
 - 1. None.
 - 2. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 - 3. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 - 4. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .
- D. Piping, Exposed to View:
 - 1. None.
 - 2. PVC: **[Standard][Color-coded by system]** .
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)]** .
 - 3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 - 4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 - 5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

3.23 OUTDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Equipment, Concealed from View:
1. None.
 2. PVC: **[Standard][Color-coded by system]** .
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)]** .
 3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .
- D. Equipment, Exposed, up to 48 Inches (1200 mm) in Diameter or with Flat Surfaces up to 72 Inches (1800 mm):
1. Aluminum: **[Smooth][Corrugated][Stucco embossed][with Z-shaped locking seam]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 2. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed][with Z-shaped locking seam]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 3. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed][with Z-shaped locking seam]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .
- E. Equipment, Exposed, Larger Than 48 Inches (1200 mm) in Diameter or with Flat Surfaces Larger Than 72 Inches (1800 mm):
1. Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) as recommended deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 2. Painted Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]**

.

a. Thickness: [0.032 inch (0.81 mm)][0.040 inch (1.0 mm)] .

3. Stainless Steel: [Type 304][or][Type 316] , [smooth,][stucco embossed,] with [1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs] .

a. Thickness: [0.020 inch (0.51 mm)][0.024 inch (0.61 mm)] .

F. Outdoor Exposed Piping:

1. PVC: [Standard][Color-coded by system] .

a. Thickness: [20 mils (0.5 mm)][30 mils (0.8 mm)][40 mils (1.0 mm)] .

2. Aluminum: [Smooth][Corrugated][Stucco embossed][with Z-shaped locking seam] .

a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)] .

3. Painted Aluminum: [Smooth][Corrugated][Stucco embossed][with Z-shaped locking seam] .

a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)] .

4. Stainless Steel: [Type 304][or][Type 316] , [smooth No. 2B finish][corrugated][stucco embossed][with Z-shaped locking seam] .

a. Thickness: [0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)] .

END OF SECTION 21 07 00 00

SECTION 21 10 00 00 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-suppression piping, fittings, and appurtenances.
2. Fire department connections.
3. Hose connections and hose stations.
4. System control valves.
5. Dry-sprinkler system nitrogen generator with purge/vent.
6. Preaction sprinkler system nitrogen generator with purge/vent.
7. Fire-suppression piping specialties.
8. Cover systems for sprinkler piping.
9. Sprinklers.
10. Alarm devices.
11. Manual control stations.
12. Control panels.
13. Pressure gauges.

B. Related Requirements:

1. Section 331415 "Site Water Distribution Piping" for site fire-suppression water-service and backflow prevention devices.

1.2 DEFINITIONS

- A. Standard-Pressure Fire-Suppression System Piping:** Piping designed to operate at working pressure of **175 psig (1200 kPa)** maximum.
- B. High-Pressure Fire-Suppression System Piping:** Piping designed to operate at working pressure higher than standard **175 psig (1200 kPa)**, but not higher than **[250 psig (1725 kPa)][300 psig (2070 kPa)]**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles.
 - b. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

C. Shop Drawings:

1. Prepare in accordance with **[NFPA 13][and][NFPA 14]** section "Working Plans."
 - a. Include plans, elevations, and sections of the system piping and details.
 - b. Include detailed riser diagram and schematic diagram showing system supply, supply connection, devices, valves, pipe and fittings, as well as the delineation of the standard-pressure and high-pressure portions of the fire-suppression system.
 - c. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Prepare computer-generated hydraulic calculations in accordance with the following:
 - a. Minimum operating pressure at hydraulically most remote fire hose valve is to be **[100 psig (690 kPa)]<Insert pressure>**.
 - b. Name of hydraulic program used.
 - c. Water supply information, including fire hydrant flow test data report.
3. Submit documents and calculations **[signed and sealed by qualified professional engineer responsible for their preparation][and][prepared by NICET Level III-certified technician, "Water-Based Systems Layout."][prepared by NICET Level IV-certified technician, "Water-Based Systems Layout."][NICET certified-technician submittals are to include the following information on each drawing title block: technician's name, NICET certification number, and NICET certification specialty area and level.]**
4. Include diagrams for power, signal, and control wiring.

- D. Delegated Design Submittals: For fire-suppression systems indicated to comply with performance requirements and design criteria, including analysis data, **[signed and sealed by the qualified professional engineer responsible for their preparation.][prepared by NICET Level III-certified technician, "Water-Based Systems Layout."][prepared by NICET Level IV-certified technician, "Water-Based Systems Layout."][NICET certified-technician submittals are to include the following information on each drawing title block: technician's name, NICET certification number, and NICET certification specialty area and level.]**

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Fire-suppression system plans and sections, or Building Information Model (BIM), drawn to scale, showing the items described in this Section and coordinated with all building trades.
- B. Seismic Qualification Certificates: For fire-suppression equipment, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Qualification Data: For qualified Installer **[and professional engineer][and NICET-certified technician]**.
- D. Design Data: Approved fire-suppression piping working plans, prepared in accordance with **[NFPA**

13][and][NFPA 14], including documented approval by AHJs, and including hydraulic calculations if applicable.

- E. Welding certificates.
- F. Field Test Reports:
 - 1. Indicate and interpret test results for compliance with performance requirements and as described in [NFPA 13][and][NFPA 14]. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 - 2. Fire-hydrant flow test report.
- G. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-suppression systems and specialties to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.
 - 2. System control valves.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by [qualified professional engineer.][NICET Level III-certified technician, "Water-Based Systems Layout."][NICET Level IV-certified technician, "Water-Based Systems Layout."]
- B. Welding Qualifications: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

1.8 FIELD CONDITIONS

- A. Interruption of Existing Fire-Suppression Service: Do not interrupt fire-suppression service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression service in accordance with requirements indicated:

1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[seven]<Insert number>** days in advance of proposed interruption of fire-suppression service.
2. Do not proceed with interruption of fire-suppression service without **[Architect's][Construction Manager's][Owner's]** written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Automatic wet-type, **[Class I][Class II][Class III]** standpipe system.
- B. Automatic dry-type, **[Class I][Class II][Class III]** standpipe system.
- C. Semiautomatic dry-type, **[Class I][Class II][Class III]** standpipe system.
- D. Manual wet-type, Class I standpipe system.
- E. Manual dry-type, Class I standpipe system.
- F. Automatic combination wet-type standpipe sprinkler system.
- G. Automatic wet-pipe sprinkler system.
- H. Automatic dry-pipe sprinkler.
- I. Automatic deluge sprinkler system.
- J. Automatic single-interlock preaction sprinkler system.
- K. Automatic double-interlock preaction sprinkler system.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-suppression system piping to withstand the effects of earthquake motions determined in accordance with **[NFPA 13][NFPA 14][and][ASCE/SEI 7]<Insert standard>**. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- B. Fire-Suppression System Components, Devices, and Accessories: Listed in ULSE's "Fire Protection Equipment Directory" and FM Approvals' "Approval Guide."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Fire-suppression system equipment, specialties, accessories, installation, and testing to comply with **[NFPA 13][NFPA 13R][NFPA 14][NFPA 13D][and][ASME A17.1]<Insert standard>**.
- E. Standard-Pressure Piping System Component: Listed for **175 psig (1200 kPa)** minimum working pressure.
- F. High-Pressure Piping System Component: Listed for **[250 psig (1725 kPa) minimum][300 psig (2070 kPa)]** working pressure.

- G. Delegated Design: Engage a [qualified professional engineer][NICET Level III-certified technician, "Water-Based Systems Layout"][NICET Level IV-certified technician, "Water-Based Systems Layout"] to design fire-suppression systems.
1. Fire-Hydrant Flow Test:
 - a. Available fire-hydrant flow test records indicate the following conditions:
 - 1) Date: <Insert test date>.
 - 2) Time: <Insert time>[a.m.][p.m.]
 - 3) Performed by: <Insert operator's name> of <Insert firm>.
 - 4) Location of Residual Fire Hydrant R: <Insert location>.
 - 5) Location of Flow Fire Hydrant F: <Insert location>.
 - 6) Static Pressure at Residual Fire Hydrant R: <Insert psig (kPa)>.
 - 7) Measured Flow at Flow Fire Hydrant F: <Insert gpm (L/s)>.
 - 8) Residual Pressure at Residual Fire Hydrant R: <Insert psig (kPa)>.
 - b. Perform fire-hydrant flow test and record the following conditions:
 - 1) Date: <Insert test date>.
 - 2) Time: <Insert time>[a.m.][p.m.]
 - 3) Performed by: <Insert operator's name> of <Insert firm>.
 - 4) Location of Residual Fire Hydrant R: <Insert location>.
 - 5) Location of Flow Fire Hydrant F: <Insert location>.
 - 6) Static Pressure at Residual Fire Hydrant R: <Insert psig (kPa)>.
 - 7) Measured Flow at Flow Fire Hydrant F: <Insert gpm (L/s)>.
 - 8) Residual Pressure at Residual Fire Hydrant R: <Insert psig (kPa)>.
 - c. Fire-hydrant flow test must be performed within previous [12]<Insert number> months prior to completion of design documents and hydraulic calculations.
 2. Margin of Safety for Available Water Flow and Pressure: [10][20]<Insert number> percent, including losses through water-service piping, valves, and backflow preventers.
 3. Sprinkler Occupancy Hazard Classifications:
 - a. Automobile Parking and Showrooms: [Ordinary Hazard, Group 1]<Insert classification>.
 - b. Churches: [Light Hazard]<Insert classification>.
 - c. Dry Cleaners: [Ordinary Hazard, Group 2]<Insert classification>.
 - d. Educational: [Light Hazard]<Insert classification>.
 - e. Electrical Equipment Rooms: [Ordinary Hazard, Group 1]<Insert classification>.
 - f. Elevator Machine Room and Hoistway: [Ordinary Hazard, Group 1]<Insert classification>.
 - g. Exterior and Interior Loading Docks, Handling Flammable/Combustible Liquids, Hazardous Materials, or Utilized for Storage: <Insert classification>.
 - h. Exterior Loading Docks, Only Handling Ordinary Combustibles: [Ordinary Hazard, Group 2]<Insert classification>.
 - i. General Storage Areas: [Ordinary Hazard, Group 1]<Insert classification>.
 - j. Hospitals, including Animal Hospitals and Veterinary Facilities: [Light Hazard]<Insert classification>.
 - k. Institutional: [Light Hazard]<Insert classification>.
 - l. Laundries: [Ordinary Hazard, Group 1]<Insert classification>.
 - m. Libraries, except Large Stack Rooms: [Light Hazard]<Insert classification>.
 - n. Libraries, Large Stack Rooms: [Ordinary Hazard, Group 2]<Insert classification>.
 - o. Machine Shops: [Ordinary Hazard, Group 2]<Insert classification>.
 - p. Mechanical Equipment Rooms: [Ordinary Hazard, Group 1]<Insert classification>.
 - q. Mercantile: [Ordinary Hazard, Group 2]<Insert classification>.



- r. Museums: **[Light Hazard]<Insert classification>**.
 - s. Nursing or Convalescent Homes: **[Light Hazard]<Insert classification>**.
 - t. Offices, including Data Processing: **[Light Hazard]<Insert classification>**.
 - u. Plastics Processing Areas: **[Extra Hazard, Group 2]<Insert classification>**.
 - v. Post Offices: **[Ordinary Hazard, Group 2]<Insert classification>**.
 - w. Printing Plants: **[Extra Hazard, Group 1]<Insert classification>**.
 - x. Printing and Publishing: **[Ordinary Hazard, Group 2]<Insert classification>**.
 - y. Repair Garages: **[Ordinary Hazard, Group 2]<Insert classification>**.
 - z. Residential: **[Light Hazard]<Insert classification>**.
 - aa. Restaurant Seating Areas: **[Light Hazard]<Insert classification>**.
 - bb. Restaurant Service Areas: **[Ordinary Hazard, Group 1]<Insert classification>**.
 - cc. Solvent Cleaning Areas: **[Extra Hazard, Group 2]<Insert classification>**.
 - dd. Stages: **[Ordinary Hazard, Group 2]<Insert classification>**.
 - ee. Theaters and Auditoriums, excluding Stages and Prosceniums: **[Light Hazard]<Insert classification>**.
 - ff. Upholstering Plants: **[Extra Hazard, Group 1]<Insert classification>**.
 - gg. **<Insert occupancy and hazard classification>**.
4. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Residential (Dwelling) Occupancy: **[0.05 gpm/sq. ft. over 400 sq. ft. (2.04 mm/min. over 37.2 sq. m)]<Insert value>** area.
 - b. Light-Hazard Occupancy: **[0.10 gpm/sq. ft. over 1500 sq. ft. (4.1 mm/min. over 140 sq. m)]<Insert value>** area.
 - c. Ordinary-Hazard, Group 1 Occupancy: **[0.15 gpm/sq. ft. over 1500 sq. ft. (6.1 mm/min. over 140 sq. m)]<Insert value>** area.
 - d. Ordinary-Hazard, Group 2 Occupancy: **[0.20 gpm/sq. ft. over 1500 sq. ft. (8.2 mm/min. over 140 sq. m)]<Insert value>** area.
 - e. Extra-Hazard, Group 1 Occupancy: **[0.30 gpm/sq. ft. over 2500 sq. ft. (12.2 mm/min. over 230 sq. m)]<Insert value>** area.
 - f. Extra-Hazard, Group 2 Occupancy: **[0.40 gpm/sq. ft. over 2500 sq. ft. (16.3 mm/min. over 230 sq. m)]<Insert value>** area.
 - g. Special Occupancy Hazard: As determined by AHJs.
5. Minimum Density for Deluge-Sprinkler Piping Design:
- a. Ordinary-Hazard, Group 1 Occupancy: **[0.15 gpm/sq. ft. (6.1 mm/min.)]<Insert value>** over entire area.
 - b. Ordinary-Hazard, Group 2 Occupancy: **[0.20 gpm/sq. ft. (8.2 mm/min.)]<Insert value>** over entire area.
 - c. Extra-Hazard, Group 1 Occupancy: **[0.30 gpm/sq. ft. (12.2 mm/min.)]<Insert value>** over entire area.
 - d. Extra-Hazard, Group 2 Occupancy: **[0.40 gpm/sq. ft. (16.3 mm/min.)]<Insert value>** over entire area.
 - e. Special Occupancy Hazard: As determined by AHJs.
6. Maximum protection area per sprinkler in accordance with ULSE listing.
7. Maximum Protection Area per Sprinkler:
- a. Residential Areas: **[400 sq. ft. (37 sq. m)]<Insert dimension>**.
 - b. Office Spaces: **[120 sq. ft. (11.1 sq. m)][225 sq. ft. (20.9 sq. m)]<Insert dimension>**.
 - c. Storage Areas: **[130 sq. ft. (12.1 sq. m)]<Insert dimension>**.
 - d. Mechanical Equipment Rooms: **[130 sq. ft. (12.1 sq. m)]<Insert dimension>**.
 - e. Electrical Equipment Rooms: **[130 sq. ft. (12.1 sq. m)]<Insert dimension>**.
 - f. Other Areas: In accordance with **[NFPA 13][NFPA 13R][NFPA 13D]** recommendations

unless otherwise indicated.

8. Total Combined Hose-Stream Demand Requirement: In accordance with NFPA 13 unless otherwise indicated:
 - a. Light-Hazard Occupancies: **[100 gpm (6.3 L/s) for 30 minutes]<Insert requirement>**.
 - b. Ordinary-Hazard Occupancies: **[250 gpm (15.75 L/s) for 60 to 90 minutes]<Insert requirement>**.
 - c. Extra-Hazard Occupancies: **[500 gpm (31.5 L/s) for 90 to 120 minutes]<Insert requirement>**.
9. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 1-1/2 (DN 40) Hose Connections: **[65 psig (450 kPa)]<Insert value>**.
 - b. NPS 2-1/2 (DN 65) Hose Connections: **[100 psig (690 kPa)]<Insert value>**.
- H. Obtain documented approval of fire-suppression system design from AHJs.

2.3 FIRE-SUPPRESSION PIPING, FITTINGS, AND APPURTENANCES

A. Steel Pipe, Fittings, and Appurtenances:

1. Schedule 40 Steel Pipe: **[Galvanized-][and][black-]**steel pipe, ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M.
 - a. Standards:
 - 1) UL 852.
 - 2) FM 1630.
 - b. Factory-applied exterior coating.
 - c. Factory-applied bacterial-resistant internal coating to reduce microbiologically influenced corrosion.
 - d. Pipe ends may be factory or field formed to match joining method.
2. Schedule 10 Steel Pipe: **[Galvanized-][and][black-]**steel pipe, ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M.
 - a. Standards:
 - 1) UL 852.
 - 2) FM 1630.
 - b. Factory-applied exterior coating.
 - c. Factory-applied bacterial resistant internal coating to reduce microbiologically influenced corrosion.
 - d. Pipe ends may be factory or field formed to match joining method.
3. Engineered Light-Wall Steel Pipe: **[Galvanized-][and][black-]**steel pipe, ASTM A135/A135M or ASTM A795/A795M with wall thickness less than Schedule 40. Outside dimension is to be equivalent to Schedule 40.
 - a. Standards:

- 1) UL 852.
- 2) FM 1630.
- b. Factory-applied exterior coating.
- c. Factory-applied bacterial-resistant internal coating to reduce microbiologically influenced corrosion.
- d. Pipe ends may be factory or field formed to match joining method.
4. Steel Pipe Nipples: **[Galvanized][and][black]** steel, ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.
5. Steel Couplings: **[Galvanized][and][uncoated]** steel, ASTM A865/A865M, threaded.
6. Gray-Iron Threaded Fittings: **[Galvanized][and][uncoated]** gray-iron threaded fittings, ASME B16.4, Class 125, standard pattern.
7. Malleable- or Ductile-Iron Unions: ASME B16.3.
8. Cast-Iron Flanges: ASME B16.1, Class 125.
9. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- a. Pipe-Flange Gasket Materials: **[AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick][ASME B16.21, nonmetallic and asbestos free][or][EPDM rubber gasket]**.
 - 1) Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - 2) Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
- b. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1 carbon steel unless otherwise indicated.
10. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.
 - a. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
11. Plain-End-Pipe Fittings:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Gruvlok; an ASC Engineered Solution]**
 - 2) **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - 3) **[Victaulic Company]**
 - 4) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Gruvlok; an ASC Engineered Solution]**
 - 2) **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - 3) **[Victaulic Company]**
 - 4) **<Insert manufacturer's name>**
 - c. Pressure Rating: **[175 psig (1200 kPa)][250 psig (1725 kPa)][300 psig (2070 kPa)]** minimum.
 - d. Plain-End Fittings for Steel Piping: **[Galvanized][Painted][Uncoated]** plain-end fittings,

- ASTM A53/A53M, carbon steel or ASTM A106/A106M, forged steel with dimensions matching steel pipe.
- e. Plain-End-Pipe Couplings for Steel Piping: Rigid pattern for steel-pipe dimensions, ductile-iron or malleable-iron housing. Include EPDM-rubber gasket, and bolts and nuts.
12. Grooved-Joint, Steel-Pipe Appurtenances:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[CPS Products, Inc.]**
 - 2) **[Gruvlok; an ASC Engineered Solution]**
 - 3) **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - 4) **[Smith-Cooper International]**
 - 5) **[SPF/Anvil; an ASC Engineered Solution]**
 - 6) **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 7) **[Victaulic Company]**
 - 8) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[CPS Products, Inc.]**
 - 2) **[Gruvlok; an ASC Engineered Solution]**
 - 3) **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - 4) **[Smith-Cooper International]**
 - 5) **[SPF/Anvil; an ASC Engineered Solution]**
 - 6) **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 7) **[Victaulic Company]**
 - 8) **<Insert manufacturer's name>**
 - c. Pressure Rating: **[175 psig (1200 kPa)][250 psig (1725 kPa)][300 psig (2070 kPa)]** minimum.
 - d. Grooved-End Fittings for Steel Piping: **[Galvanized][Painted][Uncoated]** grooved-end fittings, ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
 - e. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
13. Carbon Steel Pressure-Seal Fittings: UL 213, FM Approvals-approved, **175 psig (1200 kPa)** pressure rating with carbon steel-, zinc-nickel-coated housing, EDPM O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Mueller Streamline Co.; a company of Mueller Industries]**
 - 2) **[Viega LLC]**

- 3) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Mueller Streamline Co.; a company of Mueller Industries]**
 - 2) **[Viega LLC]**
 - 3) **<Insert manufacturer's name>**

B. Stainless Steel Pipe, Fittings, and Appurtenances:

1. Stainless Steel Pipe: ASTM A312/A312M, **[Type 304/304L][Type 316/316L]**, Schedule 10S, dimensions conforming to ASME B36.19M.
2. Stainless Steel Pipe Fittings: ASTM A403/A403M.
3. Fittings for Grooved-End, Stainless Steel Pipe:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[GroovJoint]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[GroovJoint]**
 - 2) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain appurtenance for grooved-end, stainless steel pipe from single manufacturer.
 - d. Standards: ASTM A743; ASTM A193/A193M, Class 2; and ASTM A194/A194M, Type 304, Grade 8M.
 - e. Fittings for Grooved-End, Stainless Steel Pipe: Stainless steel casting with dimensions matching stainless steel pipe.
4. Mechanical Couplings for Grooved-End, Stainless Steel Pipe:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[GroovJoint]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[GroovJoint]**
 - 2) **<Insert manufacturer's name>**

- c. AWWA C606 for stainless steel pipe dimensions.
 - d. Stainless steel housing sections.
 - e. Stainless steel bolts and nuts.
 - f. EPDM-rubber gaskets suitable for hot and cold water.
 - g. Minimum Pressure Rating:
 - 1) NPS 8 (DN 200) and Smaller: **[600 psig (4137 kPa)]<Insert value>**.
 - 2) NPS 10 and NPS 12 (DN 250 to DN 300): **[400 psig (2758 kPa)]<Insert value>**.
 - 3) NPS 14 to NPS 24 (DN 350 to DN 600): **[250 psig (1725 kPa)]<Insert value>**.
5. Stainless Steel Piping, Pressure-Seal-Joint Fittings:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[GroovJoint]**
 - 2) **[Merit Brass Company]**
 - 3) **[Victaulic Company]**
 - 4) **[Viega LLC]**
 - 5) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[GroovJoint]**
 - 2) **[Merit Brass Company]**
 - 3) **[Victaulic Company]**
 - 4) **[Viega LLC]**
 - 5) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain pressure-seal-joint fittings from single manufacturer.
 - d. Material: **[Type 304][Type 316]** stainless steel, ASTM A312/A312M.
 - e. Fittings: **[Type 304][Type 316]** stainless steel with EPDM O-ring seal in each end, and FM approved for fire protection applications.

C. Copper Tube, Fittings, and Appurtenances:

- 1. Copper Tube, Drawn Temper: **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)][and][ASTM B88, Type M (ASTM B88M, Type C)]**.
- 2. Solder-Joint Fittings, Cast Copper: ASME B16.18 pressure fittings.
- 3. Solder-Joint Fittings, Wrought Copper: ASME B16.22 pressure fittings.
- 4. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- 5. Unions, Cast Copper: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- 6. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- 7. Copper Tube, Mechanically Formed Tee Fitting: For forming T-branch on copper water tube.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) [T-DRILL Industries Inc]
 - 2) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [T-DRILL Industries Inc]
 - 2) <Insert manufacturer's name>
 - c. Description: Tee formed in copper tube in accordance with ASTM F2014.
8. Grooved, Mechanical-Joint, Copper-Tube Appurtenances:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Gruvlok; an ASC Engineered Solution]
 - 2) [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - 3) [Victaulic Company]
 - 4) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Gruvlok; an ASC Engineered Solution]
 - 2) [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - 3) [Victaulic Company]
 - 4) <Insert manufacturer's name>
 - c. Standard: UL 213.
 - d. Grooved-End Copper Fittings: ASTM B75/B75M copper tube or ASTM B584 bronze castings.
 - e. Grooved-End-Tube Couplings: To fit copper tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting EPDM-rubber gasket rated for minimum [180 deg F (80 deg C)]<Insert temperature> for use with ferrous housing and steel bolts and nuts; 300 psig (2070 kPa) minimum CWP pressure rating.
9. Copper-Tube, Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Viega LLC]
 - 2) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Viega LLC]
- 2) <Insert manufacturer's name>

- c. Fittings: Cast brass, cast bronze, or wrought copper with EPDM O-ring seal in each end.
- d. Minimum **200 psig (1379 kPa)** working-pressure rating at **250 deg F (121 deg C)**.

D. CPVC Pipe, Fittings, and Appurtenances:

1. CPVC Pipe: ASTM F442/F442M and UL 1821, SDR 13.5, for **175 psig (1200 kPa)** rated pressure at **150 deg F (62 deg C)**, with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.
2. CPVC Fittings: [UL listed][or][FM Approvals approved], for **175 psig (1200 kPa)** rated pressure at **150 deg F (62 deg C)**, socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.
 - a. NPS 3/4 to NPS 1-1/2 (DN 20 to DN 40): ASTM F438 and UL 1821, Schedule 40, socket type.
 - b. NPS 2 to NPS 3 (DN 50 to DN 80): ASTM F439 and UL 1821, Schedule 80, socket type.
 - c. CPVC-to-Metal Transition Fittings: CPVC, one piece, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
 - d. CPVC-to-Metal Transition Unions: CPVC, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
 - e. Flanges: CPVC, one or two pieces.
3. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F493 solvent cement recommended by pipe and fitting manufacturer, and made for joining CPVC sprinkler pipe and fittings. Include cleaner or primer recommended by pipe and fitting manufacturer.
4. Product Data: Verify adhesive primer has a VOC content of 550 g/L or less.
5. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
7. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
8. Product Data: Verify CPVC welding solvent cement has a VOC content of 490 g/L or less.
9. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
10. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
11. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
12. Plastic Pipe-Flange Gasket and Bolts and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connection, Exposed Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Croker; a Division of Morris Group International]**
 - b. **[Elkhart Brass Mfg. Co., Inc]**
 - c. **[Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **[Wilson & Cousins Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Croker; a Division of Morris Group International]**
 - b. **[Elkhart Brass Mfg. Co., Inc]**
 - c. **[Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **[Wilson & Cousins Inc.]**
 - g. **<Insert manufacturer's name>**
3. Standard: UL 405.
4. Description: Exposed, projecting, for wall mounting.
5. Pressure Rating: **175 psig (1200 kPa)** minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads in accordance with NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.
9. Escutcheon Plate: Round, brass, wall type.
10. Outlet: Back, with pipe threads.
11. Number of Inlets: **[Two][Three]**.
12. Escutcheon Plate Marking: **["AUTO SPKR & STANDPIPE"]["STANDPIPE"]["AUTO SPKR"]<Insert marking>**.
13. Finish: **[Polished chrome plated][Rough brass or bronze][Rough chrome plated]**.
14. Outlet Size: **[NPS 4 (DN 100)][NPS 6 (DN 150)]**.

B. Fire Department Connection, Flush Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Croker; a Division of Morris Group International]**

- b. [Elkhart Brass Mfg. Co., Inc]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]
 - e. [Wilson & Cousins Inc.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Croker; a Division of Morris Group International]
 - b. [Elkhart Brass Mfg. Co., Inc]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]
 - e. [Wilson & Cousins Inc.]
 - f. <Insert manufacturer's name>
3. Standard: UL 405.
4. Description: Flush, for wall mounting.
5. Pressure Rating: **175 psig (1200 kPa)** minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads in accordance with NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.
9. Escutcheon Plate: Rectangular, brass, wall type.
10. Outlet: With pipe threads.
11. Body Style: [Horizontal][Square][Vertical].
12. Number of Inlets: [Two][Three][Four][Six].
13. Outlet Location: [Back][Bottom][Left side][Right side][Top].
14. Escutcheon Plate Marking: ["AUTO SPKR & STANDPIPE"]["STANDPIPE"]["AUTO SPKR"]<Insert marking>.
15. Finish: [Polished chrome plated][Rough brass or bronze][Rough chrome plated].
16. Outlet Size: [NPS 4 (DN 100)][NPS 6 (DN 150)][NPS 8 (DN 200)].

C. Fire Department Connection, Yard Type:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Croker; a Division of Morris Group International]
 - b. [Elkhart Brass Mfg. Co., Inc]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Croker; a Division of Morris Group International]
 - b. [Elkhart Brass Mfg. Co., Inc]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]

e. <Insert manufacturer's name>

3. Standard: UL 405.
4. Description: Exposed, freestanding.
5. Pressure Rating: [175 psig (1200 kPa) minimum][300 psig (2070 kPa)].
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads in accordance with NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.
9. Escutcheon Plate: Round, brass, floor type.
10. Outlet: Bottom, with pipe threads.
11. Number of Inlets: [Two][Three][Four].
12. Sleeve: [Brass][Not required].
13. Sleeve Height: 18 inches (460 mm).
14. Escutcheon Plate Marking: ["AUTO SPKR & STANDPIPE"]["STANDPIPE"]["AUTO SPKR"]<Insert marking>.
15. Finish, Including Sleeve: [Polished chrome plated][Rough brass or bronze][Rough chrome plated].
16. Outlet Size: [NPS 4 (DN 100)][NPS 6 (DN 150)].

D. Fire Department Connection, Auxiliary Type:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Croker; a Division of Morris Group International]
 - b. [Guardian Fire Equipment, Inc]
 - c. [Potter Roemer LLC; a Division of Morris Group International]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Croker; a Division of Morris Group International]
 - b. [Guardian Fire Equipment, Inc]
 - c. [Potter Roemer LLC; a Division of Morris Group International]
 - d. <Insert manufacturer's name>
3. Standard: UL 405.
4. Type: [Exposed][Flush][Yard (Freestanding)].
5. Pressure Rating: 175 psig (1200 kPa) minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Universal, threadless (Storz) connector in accordance with NFPA 1963.
8. Caps: Corrosion-resistant metal, with gasket and chain.
9. Escutcheon Plate: Round, brass.
10. Outlet: Back, with pipe threads.
11. Number of Inlets: One.
12. Escutcheon Plate Marking: ["AUTO SPKR & STANDPIPE"]["STANDPIPE"]["AUTO SPKR"].
13. Finish: [Polished chrome plated][Polished brass][Powder coat].
14. Outlet Size: [NPS 4 (DN 100)][NPS 6 (DN 150)].

2.5 HOSE CONNECTIONS AND HOSE STATIONS

A. Hose Connections, Adjustable Valve:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Elkhart Brass Mfg. Co., Inc]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **[Wilson & Cousins Inc.]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Elkhart Brass Mfg. Co., Inc]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **[Wilson & Cousins Inc.]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
3. Standards:
 - a. UL 668.
 - b. UL 1468.
4. Description: Fire hose valve, with integral reducing or restricting pressure-control device, for connecting fire hose.
5. Pressure Rating: **175 psig (1200 kPa)** maximum inlet.
6. Material: Brass or bronze.
7. Size: **NPS 1-1/2 or NPS 2-1/2 (DN 40 or DN 65)**, as indicated.
8. Inlet: Female pipe threads.
9. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads in accordance with NFPA 1963 and matching local fire department threads.
10. Pattern: **[Angle][or][gate]**.
11. Pressure-Control Device Type: Pressure **[reducing][restricting]**.
12. Design Outlet Pressure Setting: **<Insert psig (kPa)>**.
13. Finish: **[Polished chrome plated][Rough brass or bronze][Rough chrome plated]**.

B. Hose Connections, Nonadjustable Valve:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Brooks Equipment Co., Inc]
- b. [Croker; a Division of Morris Group International]
- c. [Elkhart Brass Mfg. Co., Inc]
- d. [Guardian Fire Equipment, Inc]
- e. [Potter Roemer LLC; a Division of Morris Group International]
- f. [Wilson & Cousins Inc.]
- g. [Zurn Industries, LLC]
- h. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Brooks Equipment Co., Inc]
- b. [Croker; a Division of Morris Group International]
- c. [Elkhart Brass Mfg. Co., Inc]
- d. [Guardian Fire Equipment, Inc]
- e. [Potter Roemer LLC; a Division of Morris Group International]
- f. [Wilson & Cousins Inc.]
- g. [Zurn Industries, LLC]
- h. <Insert manufacturer's name>

- 3. Standard: UL 668.
- 4. Description: Fire hose valve for connecting fire hose.
- 5. Pressure Rating: **300 psig (2070 kPa)** minimum.
- 6. Material: Brass or bronze.
- 7. Size: **NPS 1-1/2 or NPS 2-1/2 (DN 40 or DN 65)**, as indicated.
- 8. Inlet: Female pipe threads.
- 9. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads in accordance with NFPA 1963 and matching local fire department threads.
- 10. Pattern: [Angle][or][gate].
- 11. Finish: [Polished chrome plated][Rough brass or bronze][Rough chrome plated].

C. Hose Stations, Rack Type, NPS 1-1/2 (DN 40):

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Brooks Equipment Co., Inc]
 - b. [Croker; a Division of Morris Group International]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]
 - e. [Wilson & Cousins Inc.]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Brooks Equipment Co., Inc]
 - b. [Croker; a Division of Morris Group International]
 - c. [Guardian Fire Equipment, Inc]
 - d. [Potter Roemer LLC; a Division of Morris Group International]

- e. **[Wilson & Cousins Inc.]**
 - f. **<Insert manufacturer's name>**
3. Hose Rack:
- a. Standard: UL 47.
 - b. Material: **[Brass or bronze with polished chrome-plated][Steel with red-enamel]** finish.
 - c. Type: Hose-rack assembly. Include hose valve, hose rack, water-retention device, hose pins, and hose.
 - d. Operation: Semiautomatic.
 - e. Sized to hold fire hose.
4. Hose Valve:
- a. Standards:
 - 1) UL 668.
 - 2) UL 1468.
 - b. **NPS 1-1/2 (DN 40)**, for connecting fire hose.
 - c. Type: **[Adjustable][Nonadjustable]**.
 - d. Pressure-Control Device: **[Pressure reducing][or][pressure restricting]**, UL 1468 integral or for field installation if indicated.
 - e. Design Outlet Pressure Setting: **[Not applicable]<Insert psig (kPa)>**.
 - f. Hose Valve and Trim Finish: **[Polished chrome-plated][Rough brass or bronze][Rough chrome-plated]**.
 - g. Pressure Rating: **300 psig (2070 kPa)** minimum.
 - h. Pattern: Angle.
 - i. Material: Brass or bronze.
 - j. Size: **NPS 1-1/2 (DN 40)**.
 - k. Inlet: Female pipe threads.
 - l. Outlet: Male hose threads in accordance with NFPA 1963 and matching local fire department threads.
5. Hose:
- a. Standards:
 - 1) NFPA 1961.
 - 2) UL 219.
 - 3) UL 401.
 - b. Description: Lined fire hose with swivel inlet, coupling, gaskets, and nozzle.
 - c. Size: **NPS 1-1/2 (DN 40)**.
 - d. Length: **[50 ft. (15 m)][75 ft. (23 m)][100 ft. (30 m)]<Insert dimension>**.
 - e. Jacket: **[Combination of natural and synthetic threads][Natural thread][Synthetic thread]**.
 - f. Lining: **[Rubber, plastic, or combination of rubber and plastic compounds][Combination of rubber and plastic compounds][Rubber compound][Plastic compound]**.
 - g. Cover: Rubber, plastic, or combination of rubber and plastic compounds.
 - h. Nozzle:
 - 1) Material: **[Brass][Polished brass][Rough chrome-plated brass][Polished chrome-plated brass][Polycarbonate plastic]**.
 - 2) Type: **[Plain, for nonadjustable water stream][Spray, adjustable from shutoff to**

fog spray or straight stream][Spray, adjustable from shutoff to full fog; for use on electrical fires].

D. Hose Stations, Rack Type, NPS 1-1/2 by NPS 2-1/2 (DN 40 by DN 65):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Guardian Fire Equipment, Inc]**
 - d. **[Potter Roemer LLC; a Division of Morris Group International]**
 - e. **[Wilson & Cousins Inc.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Guardian Fire Equipment, Inc]**
 - d. **[Potter Roemer LLC; a Division of Morris Group International]**
 - e. **[Wilson & Cousins Inc.]**
 - f. **<Insert manufacturer's name>**
3. Hose Rack:
 - a. Standard: UL 47.
 - b. Material: **[Brass or bronze with polished chrome-plated][Steel with red-enamel]** finish.
 - c. Type: Hose-rack assembly. Include hose valve, reducer adapter, hose rack, water-retention device, hose pins, and hose.
 - d. Operation: Semiautomatic.
 - e. Sized to hold fire hose.
4. Hose Valve:
 - a. Standards:
 - 1) UL 668.
 - 2) UL 1468.
 - 3) NFPA 1963.
 - b. **NPS 2-1/2 (DN 65)**, for connecting fire hose.
 - c. Type: **[Adjustable][Nonadjustable]**.
 - d. Pressure-Control Device: **[Pressure reducing][or][pressure restricting]**, UL 1468 integral or for field installation if indicated.
 - e. Design Outlet Pressure Setting: **[Not applicable]<Insert psig (kPa)>**.
 - f. Hose Valve and Trim Finish: **[Polished chrome plated][Rough brass or bronze][Rough chrome plated]**.
 - g. Pressure Rating: **300 psig (2070 kPa)** minimum.
 - h. Pattern: Angle.
 - i. Material: Brass or bronze.

- j. Size: **NPS 2-1/2 (DN 65)**.
 - k. Inlet: Female pipe threads.
 - l. Outlet: Male hose threads and matching local fire department threads.
 - m. Reducer Adapter: **NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40)**.
5. Hose:
- a. Standards:
 - 1) UL 219.
 - 2) UL 401.
 - 3) NFPA 1961.
 - b. Description: Lined fire hose with swivel inlet, coupling, gaskets, and nozzle.
 - c. Size: **NPS 1-1/2 (DN 40)**.
 - d. Length: **[50 ft. (15 m)][75 ft. (23 m)][100 ft. (30 m)]<Insert dimension>**.
 - e. Jacket: **[Combination of natural and synthetic threads][Natural thread][Synthetic thread]**.
 - f. Lining: **[Rubber, plastic, or combination of rubber and plastic compounds][Combination of rubber and plastic compounds][Rubber compound][Plastic compound]**.
 - g. Cover: Rubber, plastic, or combination of rubber and plastic compounds.
 - h. Nozzle: Spray nozzle unless plain nozzle is indicated.
 - 1) Material: **[Brass][Polished brass][Rough chrome-plated brass][Polished chrome-plated brass][Polycarbonate plastic]**.
 - 2) Type: **[Plain, for nonadjustable water stream][Spray, adjustable from shutoff to fog spray or straight stream][Spray, adjustable from shutoff to full fog; for use on electrical fires]**.
- E. Hose Stations, Reel Type, NPS 1-1/2 (DN 40):
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Crocker; a Division of Morris Group International]**
 - c. **[Guardian Fire Equipment, Inc]**
 - d. **[Potter Roemer LLC; a Division of Morris Group International]**
 - e. **[Wilson & Cousins Inc.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Brooks Equipment Co., Inc]**
 - b. **[Crocker; a Division of Morris Group International]**
 - c. **[Guardian Fire Equipment, Inc]**
 - d. **[Potter Roemer LLC; a Division of Morris Group International]**
 - e. **[Wilson & Cousins Inc.]**
 - f. **<Insert manufacturer's name>**
 - 3. Hose Reel:

- a. Standard: UL 47.
 - b. Hose Reel and Bracket Material: Steel.
 - c. Description: Hose-reel assembly. Include hose valve, wall bracket, hose reel, water-retention device, hose pins, and hose.
 - d. Operation: Semiautomatic.
 - e. Sized to hold fire hose.
 - f. Finish: Red enamel.
4. Hose Valve:
- a. Standards:
 - 1) UL 668.
 - 2) UL 1468.
 - 3) NFPA 1963.
 - b. **NPS 1-1/2 (DN 40)**, for connecting fire hose.
 - c. Type: **[Adjustable][Nonadjustable]**.
 - d. Pressure-Control Device: **[Pressure reducing][or][pressure restricting]**, UL 1468 integral or for field installation if indicated.
 - e. Design Outlet Pressure Setting: **[Not applicable]<Insert psig (kPa)>**.
 - f. Hose Valve and Trim Finish: **[Polished chrome plated][Rough brass or bronze][Rough chrome plated]**.
 - g. Pressure Rating: **300 psig (2070 kPa)** minimum.
 - h. Pattern: Angle.
 - i. Material: Brass or bronze.
 - j. Size: **NPS 1-1/2 (DN 40)**.
 - k. Inlet: Female pipe threads.
 - l. Outlet: Male hose threads and matching local fire department threads.
5. Hose:
- a. Standards:
 - 1) UL 219.
 - 2) UL 401.
 - 3) NFPA 1961.
 - b. Description: Lined fire hose with swivel inlet, coupling, gaskets, and nozzle.
 - c. Size: **NPS 1-1/2 (DN 40)**.
 - d. Length: **[50 ft. (15 m)][75 ft. (23 m)][100 ft. (30 m)]<Insert dimension>**.
 - e. Jacket: **[Combination of natural and synthetic threads][Natural thread][Synthetic thread]**.
 - f. Lining: **[Rubber, plastic, or combination of rubber and plastic compounds][Combination of rubber and plastic compounds][Rubber compound][Plastic compound]**.
 - g. Cover: Rubber, plastic, or combination of rubber and plastic compounds.
 - h. Nozzle:
 - 1) Material: **[Brass][Polished brass][Rough chrome-plated brass][Polished chrome-plated brass][Polycarbonate plastic]**.
 - 2) Type: Spray, adjustable from shutoff to **[fog spray or straight stream][full fog; for use on electrical fires]**.

2.6 SYSTEM CONTROL VALVES

- A. Listed in ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Valves: **175 psig (1200 kPa)** minimum.
 - 2. High-Pressure Piping Valves: **[250 psig (1725 kPa) minimum][300 psig (2070 kPa)]**.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. System Control Valve, Alarm Valve:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Venus Fire Protection Ltd.]**
 - d. **[Victaulic Company]**
 - e. **[Viking Group Inc.]**
 - f. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Venus Fire Protection Ltd.]**
 - d. **[Victaulic Company]**
 - e. **[Viking Group Inc.]**
 - f. **<Insert manufacturer's name>**
 - 3. Standard: UL 193.
 - 4. Design: For horizontal or vertical installation.
 - 5. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, **[retarding chamber,]** and fill-line attachment with strainer.
 - 6. Drip cup assembly pipe drain **[without valves and separate from main drain piping][with check valve to main drain piping]**.
- G. System Control Valve, Dry-Pipe Valve:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:



- a. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - b. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Venus Fire Protection Ltd.]
 - d. [Victaulic Company]
 - e. [Viking Group Inc.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - b. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Venus Fire Protection Ltd.]
 - d. [Victaulic Company]
 - e. [Viking Group Inc.]
 - f. <Insert manufacturer's name>
3. Standards:
 - a. UL 260.
 - b. UL 1486.
4. Design: Differential-pressure type.
5. Include quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
6. Air-Pressure Maintenance Device for Dry-Pipe Valve:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [General Air Products, Inc]
 - 2) [Potter Electric Signal Company, LLC]
 - 3) [Reliable Automatic Sprinkler Co., Inc. (The)]
 - 4) [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - 5) [Venus Fire Protection Ltd.]
 - 6) [Victaulic Company]
 - 7) [Viking Group Inc.]
 - 8) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [General Air Products, Inc]
 - 2) [Potter Electric Signal Company, LLC]
 - 3) [Reliable Automatic Sprinkler Co., Inc. (The)]
 - 4) [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - 5) [Venus Fire Protection Ltd.]

- 6) [Victaulic Company]
 - 7) [Viking Group Inc.]
 - 8) <Insert manufacturer's name>
- c. Standard: UL 260.
 - d. Description: Automatic device to maintain minimum air pressure in piping.
 - e. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with **14 to 60 psig (95 to 410 kPa)** adjustable range, and **[175 psig (1200 kPa)][300 psig (2070 kPa)]** outlet pressure.
7. Air Compressor for Dry-Pipe Valve:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) [Gast Manufacturing Inc]
 - 2) [General Air Products, Inc]
 - 3) [Viking Group Inc.]
 - 4) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) [Gast Manufacturing Inc]
 - 2) [General Air Products, Inc]
 - 3) [Viking Group Inc.]
 - 4) <Insert manufacturer's name>
 - c. Motor Horsepower: Fractional.
 - d. Power: 120 V ac, 60 Hz, single phase.
 - e. Sized for application and capable of achieving system supervisory pressure within 30 minutes in accordance with requirements of NFPA standards. Provide ASME air receiver tank as required to meet requirements on larger systems.
 - f. Include filters, relief valves, coolers, automatic drains, and gauges.
- H. System Control Valve, Deluge Valve:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [BERMAD Control Valves]
 - b. [CLA-VAL]
 - c. [OCV Control Valves]
 - d. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - e. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - f. [Venus Fire Protection Ltd.]
 - g. [Victaulic Company]
 - h. [Viking Group Inc.]
 - i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BERMAD Control Valves]**
 - b. **[CLA-VAL]**
 - c. **[OCV Control Valves]**
 - d. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - e. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - f. **[Venus Fire Protection Ltd.]**
 - g. **[Victaulic Company]**
 - h. **[Viking Group Inc.]**
 - i. **<Insert manufacturer's name>**
3. Standard: UL 260.
4. Design: Hydraulically operated, differential-pressure type.
5. Include trim sets for alarm-test bypass, drain, electrical water-flow alarm switch, pressure gauges, drip cup assembly piped without valves and separate from main drain line, and fill-line attachment with strainer.
6. Wet, Pilot-Line Trim Set: Include gauge to read diaphragm-chamber pressure and manual control station for manual operation of deluge valve, and connection for actuation device.

I. System Control Valve, Preaction Valve:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[BERMAD Control Valves]**
 - b. **[OCV Control Valves]**
 - c. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - d. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - e. **[Venus Fire Protection Ltd.]**
 - f. **[Victaulic Company]**
 - g. **[Viking Group Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BERMAD Control Valves]**
 - b. **[OCV Control Valves]**
 - c. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - d. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - e. **[Venus Fire Protection Ltd.]**
 - f. **[Victaulic Company]**
 - g. **[Viking Group Inc.]**
 - h. **<Insert manufacturer's name>**
3. Standard: UL 260.

4. Design: Hydraulically operated, differential-pressure type.
5. Include trim sets for alarm-test bypass, drain, electrical water-flow alarm switch, pressure gauges, drip cup assembly piped without valves and separate from main drain line, and fill-line attachment with strainer.
6. Dry, Pilot-Line Trim Set: Include dry, pilot-line actuator; air- and water-pressure gauges; low-air-pressure warning switch; air-relief valve; and actuation device. Dry, pilot-line actuator includes cast-iron, operated, diaphragm-type valve with resilient facing plate, resilient diaphragm, and replaceable bronze seat. Valve includes threaded water and air inlets and water outlet. Loss of air pressure on dry, pilot-line side allows pilot-line actuator to open and causes deluge valve to open immediately.
7. Air-Pressure Maintenance Device for Preaction Valve:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - 2) **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 3) **[Venus Fire Protection Ltd.]**
 - 4) **[Victaulic Company]**
 - 5) **[Viking Group Inc.]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - 2) **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 3) **[Venus Fire Protection Ltd.]**
 - 4) **[Victaulic Company]**
 - 5) **[Viking Group Inc.]**
 - 6) **<Insert manufacturer's name>**
 - c. Standard: UL 260.
 - d. Description: Automatic device to maintain minimum air pressure in piping.
 - e. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with **14 to 60 psig (95 to 410 kPa)** adjustable range, and **[175 psig (1200 kPa)][300 psig (2070 kPa)]** outlet pressure.
8. Air Compressor for Preaction Valve:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Gast Manufacturing Inc]**
 - 2) **[General Air Products, Inc]**
 - 3) **[Viking Group Inc.]**
 - 4) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Gast Manufacturing Inc]**
 - 2) **[General Air Products, Inc]**
 - 3) **[Viking Group Inc.]**
 - 4) **<Insert manufacturer's name>**
- c. Motor Horsepower: Fractional.
- d. Power: 120 V ac, 60 Hz, single phase.
- e. Sized for application and capable of achieving system supervisory pressure within 30 minutes in accordance with requirements of NFPA standards. Provide ASME air receiver tank as required to meet requirements on larger systems.
- f. Include filters, relief valves, coolers, automatic drains, and gauges.

2.7 DRY-SPRINKLER SYSTEM NITROGEN GENERATOR WITH PURGE/VENT

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[Engineered Corrosion Solutions]**
 - 2. **[General Air Products, Inc]**
 - 3. **[Potter Electric Signal Company, LLC]**
 - 4. **[South-Tek Systems, LLC]**
 - 5. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 6. **[UNITED Fire Systems]**
 - 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Engineered Corrosion Solutions]**
 - 2. **[General Air Products, Inc]**
 - 3. **[Potter Electric Signal Company, LLC]**
 - 4. **[South-Tek Systems, LLC]**
 - 5. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - 6. **[UNITED Fire Systems]**
 - 7. **<Insert manufacturer's name>**
- C. Description: Nitrogen generator system to serve dry sprinkler zones for piping corrosion mitigation, including system venting. System is to provide required supervisory pressure within sprinkler zone. System is to include either an integrated, oil-less air compressor, located within the nitrogen generator system package, or a separate vibration-isolation mounted air compressor, also provided by nitrogen generator manufacturer.
- D. Standards:
 - 1. FM 1035.
 - 2. UL 508A.

E. Nitrogen Generator:

1. **[Wall-mounted][skid-mounted][or][stand-alone]** nitrogen generator to provide minimum nitrogen purity of 98 percent to the designated sprinkler systems.
2. Power: 120 V ac.
3. Bypass mode and nitrogen-generating mode.
4. Minimum Capacity: **[As recommended by manufacturer]<Insert requirements>**.

F. Air Compressor:

1. Standard: ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
2. Motor Horsepower: Fractional.
 - a. Power: 120 V ac, 60 Hz, single phase.
3. Sized for application and capable of achieving system supervisory pressure within 30 minutes in accordance with requirements of NFPA 13. Provide ASME air receiver tank as required to meet requirements on larger systems.
4. Include filters, relief valves, coolers, automatic drains, and gauges.
5. Minimum Capacity: Match capacity of nitrogen generator.

G. Automatic Purge Vent/Valve:

1. Vents oxygen during system nitrogen fill.
2. Automatically closes when 98 percent minimum nitrogen has been reached.
3. Sized to allow correct purge rate per manufacturer's written instructions and with **[14 days]<Insert period>**.
4. Provide one venting device for each dry/preaction sprinkler system zone.
5. Include a connection port for a portable nitrogen purity sensor or a nitrogen purity manifold.

H. Supervisory Gas Monitoring - Nitrogen Purity Sensing Device:

1. Portable Handheld Nitrogen Purity Sensing Device: Portable sensing device to connect to the outlet of the automatic purge/vent valve during periodic inspections to obtain a nitrogen purity reading within each zone.
2. Permanently Mounted Nitrogen Purity Monitoring Device or Manifold: Permanent monitoring device to continuously monitor system's nitrogen purity.

I. BAS Alarm Integration:

1. Provide nitrogen-generation system with integrated leak-detection and bypass alarms. Program alarms into controller **[and connect to BAS]**.
 - a. Leak-detection system is to alarm if leaks develop within fire-suppression system piping.
 - b. Air bypass alarm is to activate if nitrogen-generation system is bypassed by air compressor.

2.8 PREACTION SPRINKLER SYSTEM NITROGEN GENERATOR WITH PURGE/VENT

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Engineered Corrosion Solutions]**
2. **[General Air Products, Inc]**

3. [Potter Electric Signal Company, LLC]
 4. [South-Tek Systems, LLC]
 5. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Engineered Corrosion Solutions]
 2. [General Air Products, Inc]
 3. [Potter Electric Signal Company, LLC]
 4. [South-Tek Systems, LLC]
 5. <Insert manufacturer's name>
- C. Description: Nitrogen generator system to serve preaction sprinkler zones for piping corrosion mitigation, including system venting. System is to provide required supervisory pressure within sprinkler zone. System is to include either an integrated, oil-less air compressor, located within the nitrogen generator system package, or a separate vibration-isolation mounted air compressor, also provided by nitrogen generator manufacturer.
- D. Standards:
1. FM 1035.
 2. UL 508A.
- E. Nitrogen Generator:
1. [Wall-mounted][skid-mounted][or][stand-alone] nitrogen generator to provide minimum nitrogen purity of 98 percent to the designated sprinkler systems.
 2. Power: 120 V ac.
 3. Bypass mode and nitrogen-generating mode.
 4. Minimum Capacity: [As recommended by manufacturer]<Insert requirements>.
- F. Air Compressor:
1. Standard: ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
 2. Motor Horsepower: Fractional.
 - a. Power: 120 V ac, 60 Hz, single phase.
 3. Sized for application and capable of achieving system supervisory pressure within 30 minutes in accordance with requirements of NFPA 13. Provide ASME air receiver tank as required to meet requirements on larger systems.
 4. Include filters, relief valves, coolers, automatic drains, and gauges.
 5. Minimum Capacity: Match capacity of nitrogen generator.
- G. Automatic Purge Vent/Valve:
1. Vents oxygen during system nitrogen fill.
 2. Automatically closes when 98 percent minimum nitrogen has been reached.
 3. Sized to allow correct purge rate per manufacturer's written instructions and with [14 days]<Insert period>.
 4. Provide one venting device for each dry/preaction sprinkler system zone.
 5. Include a connection port for a portable nitrogen purity sensor or a nitrogen purity manifold.
- H. Supervisory Gas Monitoring - Nitrogen Purity Sensing Device:

1. Portable Handheld Nitrogen Purity Sensing Device: Portable sensing device to connect to the outlet of automatic purge/vent valve during periodic inspections to obtain a nitrogen purity reading within each zone.
 2. Permanently Mounted Nitrogen Purity Monitoring Device or Manifold: Permanent monitoring device to continuously monitor system's nitrogen purity.
- I. BAS Alarm Integration:
1. Provide nitrogen-generation system with integrated leak-detection and bypass alarms. Program alarms into controller[**and connect to BAS**].
 - a. Leak-detection system is to alarm if leaks develop within fire-suppression system piping.
 - b. Air bypass alarm is to alarm if nitrogen-generation system is bypassed by air compressor.

2.9 FIRE-SUPPRESSION PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Victaulic Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Victaulic Company]**
 - d. **<Insert manufacturer's name>**
3. Standard: UL 213.
4. Pressure Rating: **[175 psig (1200 kPa) minimum][300 psig (2070 kPa)]**.
5. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
6. Type: Mechanical-tee and -cross fittings.
7. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
8. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
9. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[AGF Manufacturing, Inc.]**
 - b. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - c. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[AGF Manufacturing, Inc.]**
 - b. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - c. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
3. Standard: ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
 4. Pressure Rating: **[175 psig (1200 kPa) minimum][300 psig (2070 kPa)]**.
 5. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 6. Size: Same as connected piping.
 7. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Potter Roemer LLC; a Division of Morris Group International]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[Croker; a Division of Morris Group International]**
 - c. **[Potter Roemer LLC; a Division of Morris Group International]**
 - d. **<Insert manufacturer's name>**
3. Standard: UL 199.
4. Pressure Rating: **175 psig (1200 kPa)**.
5. Body Material: Brass.
6. Size: Same as connected piping.
7. Inlet: Threaded.
8. Drain Outlet: Threaded and capped.
9. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
 3. Standard: ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
 4. Pressure Rating: **[175 psig (1200 kPa) minimum][300 psig (2070 kPa)]**.
 5. Body Material: Cast- or ductile-iron housing with sight glass.
 6. Size: Same as connected piping.
 7. Inlet and Outlet: Threaded.
- E. Adjustable Drop Nipples:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aegis Technologies, Inc.]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aegis Technologies, Inc.]**
 - b. **<Insert manufacturer's name>**
 3. Standard: UL 1474.
 4. Pressure Rating: **[250 psig (1725 kPa) minimum][300 psig (2070 kPa)]**.
 5. Body Material: Steel pipe with EPDM-rubber O-ring seals.
 6. Size: Same as connected piping.
 7. Length: Adjustable.
 8. Inlet and Outlet: Threaded.
- F. Flexible Sprinkler Hose Fittings:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [ALEUM USA]
 - b. [Easyflex, Inc.]
 - c. [Flexhead; an ASC Engineered Solution]
 - d. [Gateway Tubing, Inc.]
 - e. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - f. [Victaulic Company]
 - g. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ALEUM USA]
 - b. [Easyflex, Inc.]
 - c. [Flexhead; an ASC Engineered Solution]
 - d. [Gateway Tubing, Inc.]
 - e. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - f. [Victaulic Company]
 - g. <Insert manufacturer's name>
 3. Standards:
 - a. UL 2443.
 - b. FM 1637.
 4. Description: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 5. Pressure Rating: [175 psig (1200 kPa) minimum][300 psig (2070 kPa)].
 6. Size: Same as connected piping, for sprinkler.
- G. Pressure-Reducing Valves:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CLA-VAL]
 - b. [Croker; a Division of Morris Group International]
 - c. [Elkhart Brass Mfg. Co., Inc]
 - d. [Guardian Fire Equipment, Inc]
 - e. [OCV Control Valves]
 - f. [Potter Roemer LLC; a Division of Morris Group International]
 - g. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - h. [Victaulic Company]
 - i. [Wilson & Cousins Inc.]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [CLA-VAL]

- b. [Croker; a Division of Morris Group International]
 - c. [Elkhart Brass Mfg. Co., Inc]
 - d. [Guardian Fire Equipment, Inc]
 - e. [OCV Control Valves]
 - f. [Potter Roemer LLC; a Division of Morris Group International]
 - g. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - h. [Victaulic Company]
 - i. [Wilson & Cousins Inc.]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
3. UL 668 hose valve, with integral UL 1468 reducing device.
 4. Pressure Rating: **300-psig (2070-kPa)** minimum.
 5. Material: Brass or bronze.
 6. Inlet: Female pipe threads.
 7. Outlet: Threaded with or without adapter having male hose threads.
 8. Pattern: **[Angle][or][gate]**.
 9. Finish: **[Polished chrome plated][Rough brass or bronze][Rough chrome plated]**.
- H. Automatic (Ball-Drip) Drain Valves:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - b. [Viking Group Inc.]
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Reliable Automatic Sprinkler Co., Inc. (The)]
 - b. [Viking Group Inc.]
 - c. <Insert manufacturer's name>
 3. Pressure Rating: **175 psig (1200 kPa)** minimum.
 4. Type: Automatic draining, ball check.
 5. Size: **NPS 3/4 (DN 20)**.
 6. End Connections: Threaded.
- I. Manual Air Vent/Valve:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [AGF Manufacturing, Inc.]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. **[AGF Manufacturing, Inc.]**
- b. **<Insert manufacturer's name>**

- 3. Description: Ball valve that requires human intervention to vent air.
- 4. Body: Forged brass.
- 5. Ends: Threaded.
- 6. Minimize Size: **1/2 inch (13 mm)**.
- 7. Minimum Water Working Pressure Rating: **300 psig (2070 kPa)**.

J. Automatic Air Vent:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[CLA-VAL]**
 - c. **[Engineered Corrosion Solutions]**
 - d. **[Metraflex Company (The)]**
 - e. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - f. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[CLA-VAL]**
 - c. **[Engineered Corrosion Solutions]**
 - d. **[Metraflex Company (The)]**
 - e. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - f. **<Insert manufacturer's name>**
- 3. Description: Automatic air vent that automatically vents trapped air without human intervention. Approved for use in wet-pipe fire-suppression system.
- 4. Vents oxygen continuously from system.
- 5. Float valve to prevent water discharge.
- 6. Minimum Water Working Pressure Rating: **175 psig (1207 kPa)**.

K. Automatic Air Vent Assembly:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AGF Manufacturing, Inc.]**
 - b. **[Engineered Corrosion Solutions]**
 - c. **[South-Tek Systems, LLC]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[AGF Manufacturing, Inc.]**
 - b. **[Engineered Corrosion Solutions]**
 - c. **[South-Tek Systems, LLC]**
 - d. **<Insert manufacturer's name>**
3. Description: Automatic **[dual]**air vent assembly that automatically vents trapped air without human intervention, including Y-strainer and ball valve in a pre-piped assembly. Approved for use in wet-pipe fire-suppression system.
 4. Vents oxygen continuously from system.
 5. Float valve to prevent water discharge.
 6. Minimum Water Working Pressure Rating: **175 psig (1207 kPa)**.
 7. **<Insert additional requirements specific to manufacturers>**.

2.10 COVER SYSTEMS FOR SPRINKLER PIPING

A. Cover System, Extruded PVC:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[DecoShield Systems, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DecoShield Systems, Inc.]**
 - b. **<Insert manufacturer's name>**
3. Description: System of support brackets and covers designed to protect sprinkler piping.
4. Brackets: Per cover manufacturer.
5. Covers: Factory-fabricated extruded-PVC cover with concealed attachment clips.

B. Cover System, Fabricated Steel:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[JG Innovations, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[JG Innovations, Inc.]**
 - b. **<Insert manufacturer's name>**



3. Description: System of support brackets and covers designed to protect sprinkler piping.
4. Brackets: Per cover manufacturer.
5. Covers: Factory-fabricated steel cover with concealed attachment clamps.
 - a. Stainless Steel with #4 Finish: [16][18][20][22][24] gauge.
 - b. Cold-Rolled Steel: [18][20][22][24] gauge.
 - 1) Zinc-galvanized treated to accept painting but not painted.
 - 2) Zinc galvanized, factory treated, and factory painted in colors selected by Architect from manufacturers standard/custom colors.
 - 3) Zinc galvanized, factory treated, and factory primed.

2.11 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 1. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 2. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 3. **[Victaulic Company]**
 4. **[Viking Group Inc.]**
 5. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 2. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 3. **[Victaulic Company]**
 4. **[Viking Group Inc.]**
 5. **<Insert manufacturer's name>**
- C. Standards:
 1. UL 199.
 2. UL 1626.
 3. UL 1767.
 4. FM 2000.
 5. FM 2008.
 6. FM 2030.
- D. Listed in ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
- E. Pressure Rating for Sprinklers:
 1. Standard Automatic Sprinklers: **175 psig (1200 kPa)** minimum.
 2. High-Pressure Automatic Sprinklers: **[250 psig (1725 kPa) minimum][300 psig (2070 kPa)]**.
 3. Residential Sprinklers: **175 psig (1200 kPa)** maximum.
- F. Sprinklers, Automatic Wet with Heat-Responsive Element:

1. Characteristics: Nominal 1/2-inch (13-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
 2. Standard Spray, Standard Response:
 - a. Upright.
 - b. Pendent.
 - c. Recessed pendent.
 - d. Flat, concealed pendent.
 - e. Vertical sidewall.
 - f. Horizontal sidewall.
 3. Standard Spray, Quick Response:
 - a. Upright.
 - b. Pendent.
 - c. Recessed pendent.
 - d. Flat, concealed pendent.
 - e. Vertical sidewall.
 - f. Horizontal sidewall.
 - g. Flat, concealed horizontal sidewall.
 4. Extended Coverage:
 - a. Upright.
 - b. Pendent.
 - c. Flat, concealed pendent.
 - d. Horizontal sidewall.
 - e. Flat, concealed horizontal sidewall.
 5. Residential:
 - a. Recessed pendent.
 - b. Flat, concealed pendent.
 - c. Flat, concealed horizontal sidewall.
- G. Sprinklers, Automatic Dry with Heat-Responsive Element:
1. Standard Spray, Standard Response:
 - a. Upright.
 - b. Pendent.
 - c. Recessed pendent.
 - d. Flat, concealed pendent.
 - e. Horizontal sidewall.
 2. Standard Spray, Quick Response:
 - a. Upright.
 - b. Pendent.
 - c. Recessed pendent.
 - d. Flat, concealed pendent.
 - e. Horizontal sidewall.
 - f. Flat, concealed horizontal sidewall.
- H. Special Sprinklers:

1. Attic.
 2. Combustible, concealed.
 3. ESFR.
 4. Flat spray.
 5. Hallway.
 6. Institutional.
 7. MRI/Non-Ferrous, concealed.
 8. Window.
- I. Open Sprinklers and Nozzles:
1. Nominal Orifice:
 - a. **1/2 inch (13 mm)**, with discharge coefficient K between **[5.3 and 5.8]<Insert value>**.
 - b. **17/32 inch (13.5 mm)** with discharge coefficient K between **[7.4 and 8.2]<Insert value>**.
- J. Sprinkler Finishes: **[Chrome plated][bronze][and][painted]**.
- K. Special Coatings: **[Wax][lead][and][corrosion-resistant paint]**.
- L. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: **[Chrome-plated steel, one piece, flat][Chrome-plated steel, two piece, with 1-inch (25-mm) vertical adjustment][Plastic, white finish, one piece, flat]**.
 2. Sidewall Mounting: **[Chrome-plated steel][Plastic, white finish]**, one piece, flat.
- M. Sprinkler Guards and Water Shields:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Victaulic Company]**
 - d. **[Viking Group Inc.]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - c. **[Victaulic Company]**
 - d. **[Viking Group Inc.]**
 - e. **<Insert manufacturer's name>**
 3. Standard: UL 199.
 4. Description: Wire cage with fastening device for attaching to sprinkler.

2.12 ALARM DEVICES

- A. Match alarm-device material and connection types to piping and equipment materials and connection types.
- B. Water-Motor-Operated Alarm:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Victaulic Company]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Reliable Automatic Sprinkler Co., Inc. (The)]**
 - b. **[Victaulic Company]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
 - 3. Standard: UL 753.
 - 4. Type: Mechanically operated, with Pelton wheel.
 - 5. Alarm Gong: Cast aluminum with red-enamel factory finish.
 - 6. Size: **[8-1/2-inch (216-mm)][10-inch (250-mm)][Insert diameter]** diameter.
 - 7. Components: Shaft length, bearings, and sleeve to suit wall construction.
 - 8. Inlet: **NPS 3/4 (DN 20)**.
 - 9. Outlet: **NPS 1 (DN 25)** drain connection.
- C. Electrically Operated Notification Appliances:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Notifier; Honeywell International, Inc.]**
 - b. **[Potter Electric Signal Company, LLC]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Notifier; Honeywell International, Inc.]**
 - b. **[Potter Electric Signal Company, LLC]**
 - c. **<Insert manufacturer's name>**
 - 3. Electric Bell:
 - a. Standard: UL 464.

- b. Type: Vibrating, metal alarm bell.
- c. Size: **[6-inch (150-mm) minimum-][8-inch (200-mm) minimum-][10-inch (250-mm)]** diameter.
- d. Voltage: **[120 V ac, 60 Hz, single phase][24 V dc]**.
- e. Finish: Red-enamel or polyester powder-coat factory finish, suitable for outdoor use with approved and listed weatherproof backbox.

4. Strobe/Horn:

- a. Standard: UL 464.
- b. Tone: Selectable, steady, Temporal-3 (T-3) in accordance with ISO 8201 and ANSI/ASA S3.41, 2400 Hz, electromechanical, broadband.
- c. Voltage: 120 V ac, 60 Hz.
- d. Effective Intensity: 110 cd.
- e. Finish: Red, suitable for outdoor use with approved and listed weatherproof backbox. White letters on housing identifying device as for "Fire."
- f. Sign, Integrated: Mount between backbox and strobe/horn with text visible on both sides, above and below strobe/horn. Housing to be shaped to cover surface-mounted weatherproof backbox. Sign is to consist of white lettering on red plastic identifying it as a "Sprinkler Fire Alarm" and instructing viewers to call 911, police or fire department.

D. Water-Flow Indicators:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Potter Electric Signal Company, LLC]**
 - b. **[System Sensor; Honeywell International, Inc.]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Potter Electric Signal Company, LLC]**
 - b. **[System Sensor; Honeywell International, Inc.]**
 - c. **[Viking Group Inc.]**
 - d. **<Insert manufacturer's name>**
- 3. Standard: UL 346.
- 4. Water-Flow Detector: Electrically supervised.
- 5. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125 V ac and 0.25 A, 24 V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- 6. Type: Paddle operated.
- 7. Pressure Rating: **250 psig (1725 kPa)**.
- 8. Design Installation: Horizontal or vertical.

E. Pressure Switches - Water-Flow Alarm Detection:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Potter Electric Signal Company, LLC]
 - b. [System Sensor; Honeywell International, Inc.]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Potter Electric Signal Company, LLC]
 - b. [System Sensor; Honeywell International, Inc.]
 - c. <Insert manufacturer's name>
3. Description: Electrically supervised, pressure-activated water-flow switch with retard feature.
4. Components: Two single-pole, double-throw switches with normally closed contacts.
5. Design Operation: Rising pressure to [6 psi (40 kPa), plus or minus 2 psi (13.8 kPa)]<Insert value> signals water flow.
6. Adjustability: Each switch is to be independently adjustable.
7. Wire Separation: Pressure switch to provide for separation of wiring to each switch connection to allow for low- and high-voltage connections to comply with NFPA 70, Article 760 requirements.

F. Pressure Switches - Low/High Air Pressure Supervisory:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Potter Electric Signal Company, LLC]
 - b. [System Sensor; Honeywell International, Inc.]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Potter Electric Signal Company, LLC]
 - b. [System Sensor; Honeywell International, Inc.]
 - c. <Insert manufacturer's name>
3. Description: Electrically supervised pressure supervisory switch.
4. Components: Two single-pole, double-throw switches.
5. Design Operation: Detects increase and/or decrease from normal supervisory air pressure.
6. Adjustability: Each switch is to be independently adjustable.
7. Wire Separation: Pressure switch to provide for separation of wiring to each switch connection to allow for low- and high-voltage connections to comply with NFPA 70, Article 760 requirements.

G. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:



- a. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - b. **[Potter Electric Signal Company, LLC]**
 - c. **[System Sensor; Honeywell International, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - b. **[Potter Electric Signal Company, LLC]**
 - c. **[System Sensor; Honeywell International, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Standard: UL 346.
4. Type: Electrically supervised.
5. Design: Signals that controlled valve is in other than fully open position.
6. Wire Terminal Designations: Indicates normal switch position when switch is properly installed on valve and valve is fully open.
7. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
8. OS&Y Valve Supervisory Switches:
 - a. One or two single-pole, double-throw switches.
 - b. NEMA Rating: NEMA 4 and NEMA 6P enclosures suitable for mounting in any position indoors or outdoors.
 - c. Visual Switch Indication: Indicates device is properly installed and OS&Y valve is fully open.
 - d. Mounting Hardware: Mounting bracket to grip valve yoke and prevent movement of switch assembly on OS&Y valve.
 - e. Trip Rod Length: Adjustable
9. Butterfly Valve Supervisory Switches:
 - a. Two single-pole, double-throw switches.
 - b. NEMA Rating: NEMA 4 and NEMA 6P enclosures suitable for mounting in any position indoors or outdoors.
 - c. Mounting Hardware: Removable nipple.
 - d. Trip Rod Length: Adjustable
10. Ball Valve Supervisory Switches:
 - a. One single-pole, double-throw switch.
 - b. NEMA Rating: NEMA 4 enclosure suitable for mounting in any position indoors or outdoors.
 - c. Mounting Hardware: Suitable for mounting directly to pipe, ball valves, or backflow preventers sized from up to **NPS 2 (DN 50)**.
- H. Indicator-Post Supervisory Switches:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Potter Electric Signal Company, LLC]**
 - b. **[System Sensor; Honeywell International, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Potter Electric Signal Company, LLC]**
 - b. **[System Sensor; Honeywell International, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.13 MANUAL CONTROL STATIONS

- A. Listed in ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide"
- B. Description: For hydraulic operation, with union, **NPS 1/2 (DN 15)** pipe nipple, and bronze ball valve.
- C. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.14 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 1. Listed in ULSE's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 2. Electrical characteristics are 120 V ac, 60 Hz, with 24 V dc rechargeable batteries.
 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Manual Control Stations, Electric Operation: Metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations, Hydraulic Operation: Provide union, **NPS 1/2 (DN 15)** pipe nipple, and bronze ball valve. Include metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panel Components:
 1. Power supply.
 2. Battery charger.
 3. Standby batteries.
 4. Field-wiring terminal strip.
 5. Electrically supervised solenoid valves and polarized fire-alarm bell.
 6. Lamp test facility.
 7. Single-pole, double-throw auxiliary alarm contacts.
 8. Rectifier.

2.15 PRESSURE GAUGES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[AGF Manufacturing, Inc.]**
 2. **[Ametek U.S. Gauge]**
 3. **[Ashcroft Inc]**
 4. **[Brecco Corporation]**
 5. **[WIKA Instrument Corporation]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[AGF Manufacturing, Inc.]**
 2. **[Ametek U.S. Gauge]**
 3. **[Ashcroft Inc]**
 4. **[Brecco Corporation]**
 5. **[WIKA Instrument Corporation]**
 6. **<Insert manufacturer's name>**
- C. Standard: UL 393.
- D. Dial Size: **3-1/2- to 4-1/2-inch (90- to 115-mm)** diameter.
- E. Pressure Gauge Range: **[0 to 250 psig (0 to 1725 kPa) minimum][0 to 300 psig (0 to 2070 kPa)]**.
- F. Water System Piping Gauge: Include "WATER" or "AIR/WATER" label on dial face.
- G. Air System Piping Gauge: Include **[retard feature and]** "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test. Use results for system design calculations required in "Quality Assurance" Article.
1. Flow test is to be performed to meet the criteria established by **[NFPA 13][and][NFPA 14]**.
 2. Flow test is to be conducted in accordance with NFPA 291.
 3. Test is to be performed during a period of ordinary demand for the water system.
 - a. To obtain satisfactory test results of expected flow or rated capacities, sufficient discharge should be achieved to cause drop of at least 10 percent.
 4. Pitot readings are to be taken at the **2-1/2-inch (65-mm)** orifice connection.
 5. The pitot reading is to range from **10 to 35 psig (68.9 kPa to 241.3 kPa)**.
 6. Open additional hydrant outlets as needed to control pitot readings.
 7. The pitot pressure and corresponding residual pressure readings are to be taken consecutively as pressure fluctuates between a high number and low number.

B. Flow Test Data Written Report:

1. Flow data report is to be written in accordance with NFPA 291.
2. Flow data report is to include a copy of all flow data recorded during the test, including a site plan showing the tested fire hydrants with respect to the fire water service to the building. Site plan is to indicate which hydrant was flowed and which hydrant was used for pressure reading. Provide date of test, name of testing agency, and name of individual performing test.

C. Water Supply Curve: Provide water supply curve based on the lowest supply for a given set of test data. For a given residual pressure reading, the supply is to be graphed utilizing the corresponding pitot pressure/flow reading and static pressure reading.

D. Documentation is to include calibration certifications for gauges used in the flow tests. The certifications are to be from within the previous six (6) months from a reputable agency recognized for certifying pressure gauges.

E. Report flow test results promptly and in writing. A copy of the flow test data report is to be submitted with the hydraulic calculations.

3.2 INSTALLATION OF FIRE-SUPPRESSION WATER-SERVICE PIPING

- A. Comply with requirements for fire-suppression water-service piping in Section 331415 "Site Water Distribution Piping."

3.3 INSTALLATION OF DOMESTIC WATER-SUPPLY CONNECTIONS

- A. Connect fire-suppression water piping to building's interior domestic water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 331415 "Site Water Distribution Piping."

3.4 INSTALLATION OF FIRE-SUPPRESSION PIPING

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
1. Deviations from approved working plans for piping require written approval from AHJs. File written approval with Architect before deviating from approved working plans.
 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with **[NFPA 13][and][NFPA 14]** requirements for installation of fire-suppression piping.
- C. Install seismic restraints on piping. Comply with NFPA standards requirements for seismic-restraint device materials and installation.
- D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

- E. Install unions adjacent to each valve in pipes **NPS 2 (DN 50)** and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having **NPS 2-1/2 (DN 65)** and larger end connections.
- G. Install inspector's test connections in sprinkler system piping, complete with shutoff valve, and sized and located in accordance with NFPA 13.
- H. Install fire-suppression system piping with drains for complete system drainage. Extend drain piping to exterior of building where possible.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire department connection, to drain piping between fire department connection and check valve. Install drain piping to and spill over floor drain or to exterior of building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for fire-suppression piping in accordance with NFPA standards. Comply with requirements for hanger materials in NFPA standards. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe/sprinkler supply. Include pressure gauges with connection not less than **NPS 1/4 (DN 8)** and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.
- N. Pressurize and check [**dry-pipe**][**preaction**] standpipe or sprinkler system piping and [**air-pressure maintenance devices**][**air compressors**].
- O. Fill wet-type fire-suppression system piping with water.
- P. Drain dry-type fire-suppression system piping.
 - 1. Install electric heating cables and pipe insulation on fire-suppression piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210500 "Common Work Results for Fire-Suppression Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210500 "Common Work Results for Fire-Suppression Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210500 "Common Work Results for Fire-Suppression Piping."

3.5 INSTALLATION OF PIPING JOINTS

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have

finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

- B. Install unions adjacent to each valve in pipes **NPS 2 (DN 50)** and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having **NPS 2-1/2 (DN 65)** and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts in accordance with ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12, using qualified processes and welding operators in accordance with "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.
- M. Brazed Joints: Join copper tube and fittings in accordance with Copper Development Association's "Copper Tube Handbook," "Brazed Joints" chapter.
- N. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.
- O. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- P. Extruded-Tee Connections: Form tee in copper tube in accordance with ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and

braze branch tube into collar.

- Q. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- R. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join in accordance with ASTM D2846/D2846M Appendix.

3.6 INSTALLATION OF FIRE DEPARTMENT CONNECTIONS

- A. Install wall-type fire department connections.
- B. Install yard-type fire department connections in concrete slab support. Comply with requirements for concrete in Section 033000 "Cast-in-Place Concrete."
- C. Install **[two][three]<Insert number>** protective pipe bollards **[around][on sides of]** each fire department connection. Comply with requirements for bollards in Section 055000 "Metal Fabrications."
- D. Install automatic (ball-drip) drain valve at each check valve for fire department connection.

3.7 INSTALLATION OF HOSE CONNECTIONS AND HOSE STATIONS

- A. Examine roughing-in for hose connections and hose stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and hose stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install hose connections adjacent to standpipes.
- E. Install freestanding hose connections and hose stations for access and minimum passage restriction.
- F. Install **NPS 1-1/2 (DN 40)** hose-connection and hose-station valves with flow-restricting device unless otherwise indicated.
- G. Install **NPS 2-1/2 (DN 65)** hose connections with quick-disconnect **NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40)** reducer adapter and flow-restricting device unless otherwise indicated.
- H. Install wall-mounted-type hose connections and wall-mounted, rack hose stations in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for cabinets in Section 104413 "Fire Protection Cabinets."
- I. Install freestanding hose stations with support or bracket attached to standpipe.

- J. Install hose-reel hose stations on wall with bracket.

3.8 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping in accordance with manufacturer's installation manual and in accordance with NFPA 13 or NFPA 13R for supports.

3.9 INSTALLATION OF VALVES AND SPECIALTIES

- A. Install listed fire-suppression system control valves, trim and drain valves, specialty valves and trim, controls, and specialties in accordance with manufacturer's installation instructions, NFPA standards, and AHJ.
- B. Install listed fire-suppression system shutoff valves in supervised open position, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. System Control Valves:
 - 1. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
 - 2. Install **[dry-pipe][and][preaction]** valves with trim sets for air supply, drain, priming level, alarm connections, ball-drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.
 - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with **[14 to 60 psig (95 to 410 kPa)]<Insert value>** adjustable range; and **[175 psig (1200 kPa)]<Insert value>** maximum inlet pressure.
 - c. Install compressed-air-supply piping from building's compressed-air piping system.
 - 3. Install deluge valves with trim sets for drain, priming level, alarm connections, ball-drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
- D. Air Vent:
 - 1. Provide at least one air vent at high point in each wet-pipe fire-suppression system in accordance with NFPA standards. Connect vent into top of fire-suppression piping.
 - 2. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.
 - 3. Pipe from outlet of air vent to drain.

3.10 INSTALLATION OF SPRINKLERS

- A. Install sprinklers in suspended ceilings symmetrically in center of **[narrow dimension of]** acoustical ceiling panels within tolerance of **[1/2 inch (12.7 mm)]<Insert dimension>**. Coordinate entire pattern of sprinkler locations with approved reflected ceiling plan.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

- C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.11 INSTALLATION OF NITROGEN GENERATOR WITH PURGE/VENT SYSTEM

- A. Install in accordance with manufacturer's written installation instructions.
- B. Locate purge vent/valve in accordance with manufacturer's written installation instructions.
- C. Route alarm signals in code-approved electrical conduit from nitrogen generator system control panel to the supervisory circuit of BAS.

3.12 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping in accordance with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.13 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect fire-suppression systems in accordance with NFPA standards.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire department equipment.
 - 9. Verify that sprinklers' original factory finish has not been contaminated with dirt, debris, or paint. Sprinklers containing other-than-original factory finish are to be considered defective and replaced with new products. Repair and/or cleaning is not acceptable.
- C. Fire-suppression piping system will be considered defective if it does not pass tests and inspections.
- D. Fire-suppression piping system components considered defective during testing will be replaced with new components. Repair of defective components is not acceptable.
- E. Prepare test and inspection reports.

3.14 CLEANING

- A. Clean dirt and debris from fire-suppression system piping, system control valves, sprinklers, and

associated components.

- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.15 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain **[system control valves][and][pressure-maintenance pumps]**.

3.16 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with **[threaded ends, cast-iron threaded fittings, and threaded][grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved]** joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- D. CPVC pipe, **[Schedule 40][Schedule 80]** CPVC fittings, and solvent-cemented joints may be used for light-hazard and residential occupancies.
- E. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2 (DN 50) and Smaller, to Be One of the Following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. Schedule 40, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
 - 4. Schedule 40, galvanized-steel pipe with plain ends; galvanized, plain-end-pipe fittings; and twist-locked joints.
 - 5. Schedule 40, black-steel pipe with **[cut-][or][roll-]**grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 6. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 7. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - 8. **[Schedule 10][or][engineered light-wall]**, steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 9. **[Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
 - 10. **[Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; welding fittings; and welded joints.
 - 11. **[Schedule 40][or][Schedule 10S]** steel pipe; steel pressure-seal fittings; and pressure-sealed joints.
 - 12. **[Type L (Type B)][Type M (Type C)]**, hard copper tube with plain ends; **[cast-][or][wrought-]**copper, solder-joint fittings; and brazed joints.
 - 13. **[Type L (Type B)][Type M (Type C)]**, hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
 - 14. **NPS 2 (DN 50), [Type L (Type B)][Type M (Type C)]**, hard copper tube with roll-grooved ends;

copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

- F. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), to Be One of the Following:
- Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - Schedule 40, black-steel pipe with **[cut-][or][roll-]**grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - [Schedule 10][or][engineered light-wall]**, steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - [Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; welding fittings; and welded joints.
 - [Type L (Type B)][Type M (Type C)]**, hard copper tube with plain ends; **[cast-][or][wrought-]**copper, solder-joint fittings; and brazed joints.
 - [Type L (Type B)][Type M (Type C)]**, hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
 - [Type L (Type B)][Type M (Type C)]**, hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.
- G. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 5 (DN 125) and Larger, to Be One of the Following:
- Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - Schedule 40, black-steel pipe with **[cut-][or][roll-]**grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - [Schedule 10][or][engineered light-wall]**, steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - [Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; welding fittings; and welded joints.
 - [Type L (Type B)][Type M (Type C)]**, hard copper tube with plain ends; **[cast-][or][wrought-]**copper, solder-joint fittings; and brazed joints.
 - [Type L (Type B)][Type M (Type C)]**, hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.
- H. High-Pressure, Wet-Pipe Sprinkler System, NPS 4 (DN 100) and Smaller, to Be One of the Following:
- Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - [Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; welding fittings; and welded joints.

- I. High-Pressure, Wet-Pipe Sprinkler System, NPS 5 (DN 125) and Larger, to Be One of the Following:
 1. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 2. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 4. **[Schedule 10][or][engineered light-wall]**, steel pipe with plain ends; welding fittings; and welded joints.

3.17 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 1. Rooms without Ceilings: **[Upright sprinklers]<Insert type>**.
 2. Rooms with Suspended Ceilings: **[Pendent sprinklers][Recessed sprinklers][Flat concealed sprinklers][Vertical sidewall sprinklers][Pendent, recessed, flat concealed, vertical sidewall sprinklers as indicated]**.
 3. Wall Mounting: **[Horizontal sidewall sprinklers][Flat concealed sidewall sprinklers][Horizontal sidewall, flat concealed sidewall sprinklers as indicated]**.
 4. Spaces Subject to Freezing: **[Upright sprinklers][Dry pendent sprinklers][Dry sidewall sprinklers][Upright sprinklers, dry pendent sprinklers, and dry sidewall sprinklers as indicated]**.
 5. Deluge-Sprinkler Systems: **[Upright][and][pendent]**, open sprinklers.
 6. Special Applications: **[Extended-coverage, flow-control, and quick-response sprinklers where indicated][Attic sprinklers][Combustible concealed space sprinklers][Institutional space sprinklers]<Insert type>**.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 1. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces and locations not generally exposed to view; and wax coated where exposed to acids, chemicals, or other corrosive fumes.
 2. Recessed Sprinklers: Bright chrome, with **[bright chrome][factory-painted white]** escutcheon.
 3. Flat Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 4. Residential Sprinklers: Dull chrome.

END OF SECTION 21 10 00 00



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Task	Specification	Specification Description
21 10 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 11 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 11 00 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 11 19 00	01 91 13 00a	Commissioning Of Fire Suppression
21 11 19 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 12 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 12 00 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 12 13 00	01 91 13 00a	Commissioning Of Fire Suppression
21 12 13 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 12 23 00	01 91 13 00a	Commissioning Of Fire Suppression
21 12 23 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 12 29 00	01 91 13 00a	Commissioning Of Fire Suppression
21 12 29 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 00 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 13 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 13 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 16 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 19 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 19 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 26 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 26 00	21 10 00 00	Water-Based Fire-Suppression Systems



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SECTION 21 13 39 00 - FOAM-WATER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Foam-water systems.

1.2 DEFINITIONS

- A. AFFF: Aqueous film-forming foam.
- B. AR-AFFF: Alcohol-resistant aqueous film-forming foam.
- C. Discharge Devices: Include, but are not limited to, sprinklers, spray nozzles, and hose nozzles.

1.3 SYSTEM DESCRIPTION

- A. Description: Engineered, fixed, **[wet-pipe][dry-pipe][preaction][deluge]**, automatically actuated, low-expansion, **[AR-]AFFF** fire-extinguishing system for flammable-liquid fires. System includes diaphragm proportioning tanks and devices as described in NFPA 16.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the following:
 - 1. Piping, valves, fittings, and hangers.
 - 2. Seismic restraints for all equipment.
 - 3. Foam concentrate storage tanks.
 - 4. Foam concentrate.
 - 5. Discharge devices. Include flow characteristics.
 - 6. Monitoring and alarm devices. Include electrical data and supervision method.
 - 7. Foam-concentrate pumps. Include power supply and controller.
 - 8. Foam-concentrate storage tanks.
 - 9. Strainers.
 - 10. Test connections.
- B. Shop Drawings: For foam-water systems. Prepare in accordance with requirements of NFPA 16, to include, but not be limited to, the following:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include design calculations.
 - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, manufacturer-required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Include diagrams for power, signal, and control wiring.
 - 5. Permit-Approved Documents: Working plans and hydraulic calculations approved by authorities having jurisdiction.



- C. Delegated-Design Submittal: For foam-water systems indicated to comply with performance and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Seismic Qualification Data: Certificates for fire-extinguishing-agent containers and control panels, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For foam-water fire-extinguishing system to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Valves and specialties.
 - b. Bladder tanks and proportioning devices.
 - c. Foam concentrate.
 - d. Discharge devices. Include flow characteristics.
 - e. Monitoring and alarm devices. Include supervision method.
 - f. Foam-concentrate pumps. Include controller.
 - g. Foam-concentrate storage tanks.
 - h. Strainers.
 - i. Test connections.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
 - 1. Discharge Devices: Not less than [20]<Insert number> percent of amount of each type installed.
 - 2. Foam Concentrate: Not less than [200]<Insert number> percent of amount installed.

1.8 QUALITY ASSURANCE

- A. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Approvals' "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."
- D. Standard Working Pressure of Piping-System Component: Listed for a minimum of **175 psig (1200 kPa)**.
- E. Unless authorities having jurisdiction have stricter requirements, minimum design parameters are as follows:
 - 1. Solution: **[3]<Insert number>** percent foam-water solution.
 - 2. Sprinkler Spacing: Maximum of **[100 sq. ft. (9.5 sq. m)]<Insert area>** per sprinkler, and maximum **[12-foot (3.7-m)]<Insert dimension>** spacing.
 - 3. Design Density: Minimum **[0.16 gpm/sq. ft. (0.108 L/s per sq. m)]<Insert value>**.
 - 4. Foam Supply: Minimum **[10]<Insert number>**-minute discharge time.
 - 5. Water Supply: Minimum **[60]<Insert number>** minutes.
 - 6. Remote Area: Minimum **[5000-sq. ft. (476-sq. m)]<Insert area>** design area for closed-sprinkler systems. Open-sprinkler systems shall discharge over the entire system area.
 - 7. Sprinkler Temperature Rating: Maximum **250 to 300 deg F (121 to 149 deg C)** at a roof or ceiling, and **135 to 170 deg F (57 to 77 deg C)** for intermediate sprinklers.
- F. Seismic Performance: Fire-suppression piping shall withstand the effects of earthquake motions determined in accordance with **[NFPA 13][and][ASCE/SEI 7]<Insert requirement>**.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
 - 2. Component Importance Factor: **[1.5][1.0]**.
 - 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

2.2 CONCENTRATE PIPING MATERIALS

- A. Comply with requirements specified in Section 211000 "Water-Based Fire-Suppression Systems" for pipes, fittings, joining materials, and valves.
- B. Schedule 40, Black Steel Pipe: ASTM A53/A53M, **[Type E]<Insert type>**, **[Grade B]<Insert grade>** or ASTM A795/A795M, **[Type E]<Insert type>**. Pipe ends may be factory or field formed to match joining method.



1. Gray Iron Threaded Fittings, Classes 125 and 250: ASME B16.4.
2. Gray Iron Pipe Flanges and Flanged Fittings: ASME B16.1.
3. Malleable Iron Threaded Fittings, Classes 150 and 300: ASME B16.3.

C. Stainless Steel Pipe: ASTM A312/A312M, Schedule 40, **[Type 304][or][Type 316]**, with factory-formed threaded or beveled ends; ASTM A376/A376M for seamless pipe; or ASTM A213/A213M, ASTM A249/A249M, and ASTM A269/A269M for seamless and welded tubing.

1. Class 150 Threaded Fittings: ASME B16.3 and MSS SP-114.
2. Butt-Weld Fittings: ASTM A403/A403M.
3. Flanges, Forged Fittings and Flanges, and Socket-Weld Fittings: ASTM A182/A182M.
4. Bar Stock and Compression Fittings: ASTM A276/A276M and ASTM A479/A479M.

D. Red Brass Pipe: ASTM B43, Schedule 40, with factory- or field-formed threaded ends.

1. Threaded Fittings: ASME B16.11.

2.3 VALVES

A. Comply with requirements specified in Section 210523 "General-Duty Valves for Fire Protection Piping."

1. UL listed or FM Approved for use in fire-protection systems.
2. Compatible with type of foam concentrate used.

2.4 FOAM-WATER SYSTEMS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
2. **[Chemguard; brand of Johnson Controls International plc, Building Solutions North America]**
3. **[National Foam]**
4. **[Viking Group Inc.]**
5. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
2. **[Chemguard; brand of Johnson Controls International plc, Building Solutions North America]**
3. **[National Foam]**
4. **[Viking Group Inc.]**
5. **<Insert manufacturer's name>**

C. Source Limitations: Obtain system components from single source from single manufacturer.

D. System components to be in accordance with NFPA 16, be compatible with the foam concentrate, and be designed to be drained and cleaned.

E. Foam-Concentrate Storage Tanks:

1. Buna-N, bladder-type proportioning tank complying with UL 162 and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with foam-concentrate pumps and for specific type of foam concentrate used. Include bladder, internal piping, fill and drain, glass sight gage, piping, and valves. Contain concentrate in the bladder.
 - a. Orientation: **[Horizontal design with saddle][Vertical design with skirt]** support.
2. Atmospheric type, complying with UL 162 and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with foam-concentrate pumps and for specific type of foam concentrate used. Include pressure-vacuum vent, fill and drain, glass sight gauge, piping, and valves.

F. Foam-Concentrate Pumps: Listed for use in foam-water systems in accordance with NFPA 20. Include supply-side pressure relief valve and drain cock or valve.

G. Proportioning Controllers: Venturi type complying with UL 162 and of capacity to match design at minimum and maximum flow.

H. Concentrate Control Valves: Water-operated ball or deluge valve designed to open with flow through the proportioning controller.

I. Concentrate Strainers: Bronze body and stainless steel mesh strainer with minimum **0.125-inch (3.2-mm)** perforations to remove solids that would block system components.

J. Pressure Gauges: Comply with UL 393; with **3-1/2-inch (90-mm)** minimum-diameter dial, **0- to 300-psig (0- to 2070-kPa)** dial range, and caption "WATER" or "CONCENTRATE" on dial face.

2.5 FOAM CONCENTRATE

A. Description: **[AR-]**AFFF liquid concentrate, complying with NFPA 11 and UL 162, for making foam-water fire-extinguishing foam solution.

2.6 DISCHARGE DEVICES

A. Discharge devices shall be UL listed or FM Approved.

B. Sprinklers: **[Closed,][Open,][non-]**air-aspirating type; UL listed or FM Approved and listed for use with type of foam concentrate used.

C. Spray Nozzles: For foam water; include foam generator and distributing deflector to distribute foam or water.

2.7 MONITORING DEVICES

A. Valve Supervisory Switches: Single pole, double throw, with normally closed contacts complying with UL 753. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when valve is in other than fully open position.

B. Pressure Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when switch is in other than fully open position.



- C. Flow Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when switch is in other than fully open position.

2.8 ALARM DEVICES

- A. Description: UL listed or FM Approved, low voltage, and surface mounting. Alarm and monitoring devices are specified in Section 284600 "Fire Detection and Alarm" or Section 284614 "Single- and Multiple-Station Alarms."

PART 3 - EXECUTION

3.1 CONCENTRATE STORAGE TANK INSTALLATION

- A. Equipment Mounting:
 - 1. Install concentrate storage tanks on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
 - 3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
- B. Install concentrate storage tanks anchored to substrate in accordance with tank manufacturer's written instructions.
- C. Install tanks level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- D. **[Install seismic restraints for tanks.]**Anchor tanks to substrate.

3.2 PIPING INSTALLATION

- A. Install piping and components level and plumb.
- B. Install pipe and fittings, valves, and discharge devices in accordance with requirements listed in NFPA 16, "Installation of Foam-Water Sprinkler and Foam-Water Spray Systems."
 - 1. Support piping using supports and methods in accordance with NFPA 13.
 - 2. Install seismic restraints for concentrate storage tanks and piping systems.
 - 3. Install monitoring and alarm devices in accordance with NFPA 16 and NFPA 72.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on piping, valves, apparatus, and equipment having **NPS 2-1/2 (DN 65)** and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before

assembly.

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for foam concentrate. Join flanges with gasket and bolts in accordance with ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.
- J. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12, using qualified processes and welding operators in accordance with "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems and with foam concentrate.

3.3 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 211000 "Water-Based Fire-Suppression Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Provide concentrate control and drain valves with piping to permit maintenance of foam concentrate with continuous sprinkler-system service.
- C. Install proportioning controller in fire-suppression piping to provide coverage to area indicated on Drawings.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.



1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

- E. Connect electrical devices to building's fire-alarm system. Comply with requirements for wiring and connections in Section 284600 "Fire Detection and Alarm" or Section 284614 "Single- and Multiple-Station Alarms."
- F. Install a fire-department connection on the supply side of the proportioning controller when required.

3.5 LABELING

- A. Install labeling on piping, equipment, and panels in accordance with Section 210553 "Identification for Fire-Suppression Piping and Equipment."

3.6 CHARGING SYSTEM

- A. Fill proportioning tanks with foam concentrate after field quality-control testing is complete and satisfactory results have been achieved.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]**.
- D. Tests and Inspections: Comply with operating instructions and procedures in NFPA 16, Chapter "Acceptance Tests." Include the following tests and inspections to demonstrate compliance with requirements:
1. Engage the services of a qualified professional engineer to inspect installed fire-extinguishing systems, prepare installation report, and certify that installation complies with the Contract Documents, calculations, and requirements of authorities having jurisdiction.
 2. Check mechanical items.
 3. Inspect equipment and check mountings for adequate anchoring to substrate.
 4. Check electrical systems.
 5. Flush supply piping.
 6. Perform hydrostatic pressure test.
 7. Perform acceptance test.
 8. Perform proportioning system test.
 9. Perform discharge test.
 10. Flush system piping.
 11. Correct malfunctioning equipment; retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or does not perform as specified and indicated; retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
 12. After installing foam-water fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with NFPA 16.

13. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 14. Operational Test: After electrical circuitry has been energized, start systems to confirm proper unit operation.
 15. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Foam fire-extinguishing piping system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

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Task	Specification	Specification Description
21 13 39 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 39 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 13 41 00	01 91 13 00a	Commissioning Of Fire Suppression
21 13 41 00	21 10 00 00	Water-Based Fire-Suppression Systems
21 20 00 00	01 91 13 00a	Commissioning Of Fire Suppression



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SECTION 21 21 00 00 - HIGH-PRESSURE, CARBON-DIOXIDE FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carbon dioxide.
2. Pipes and fittings.
3. High-pressure flexible-hose connectors.
4. Carbon-dioxide cylinders.
5. Cylinder valves.
6. Discharge nozzles.
7. Hangers and supports.
8. Fire-control panels.
9. Detection devices.
10. Manual stations.
11. Switches.
12. Alarm devices

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For high-pressure, carbon-dioxide fire-extinguishing system, signed and sealed by a qualified professional engineer.

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For high-pressure, carbon-dioxide fire-extinguishing system, signed and sealed by a qualified professional engineer.

1. Indicate compliance with performance requirements and design criteria, including analysis data.
2. Design Calculations: For weight, volume, and concentration of extinguishing agent required for each hazard area.
3. Reflected Ceiling Plans:
 - a. Show ceiling penetrations.
 - b. Ceiling-mounted carbon-dioxide fire-extinguishing system items.
 - c. Extinguishing-agent containers if mounted above floor.
 - d. Piping, discharge nozzles, detectors, and accessories.
 - e. Hangers and supports, including hanger types and spacing and methods for attaching



- hangers to building structure.
- f. Coordination with items mounted in and above ceiling other than carbon-dioxide fire-extinguishing systems, including ceiling construction components.

4. Occupied Work Area Plans:

- a. Controls and alarms.
- b. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
- c. Coordination with equipment and furnishings protected by the system.

5. Access Floor Space Plans:

- a. Extinguishing-agent containers, piping, discharge nozzles, detectors, and accessories.
- b. Method of supporting piping.

1.3 INFORMATIONAL SUBMITTALS

A. Design Data:

- 1. Permit-Approved Drawings: Working plans, including design calculations prepared according to NFPA 12, that have been approved by authorities having jurisdiction.

B. Seismic Qualification Data: Certificates, for container foundations, cylinder racks, supports, hangers, braces, accessories, and components, from manufacturer.

- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity, and locate and describe mounting and anchorage provisions.
- 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Contracts:

- 1. Maintenance service agreement.

B. Operation and Maintenance Data: For carbon-dioxide fire-extinguishing system to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

1. Detection Devices: Not less than [20]<Insert number> percent of amount of each type installed.
2. Container Valves: Not less than [10]<Insert number> percent of amount of each size and type installed.
3. Nozzles: Not less than [20]<Insert number> percent of amount of each type installed.
4. Extinguishing Agent: Not less than [100]<Insert number> percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design a high-pressure, carbon-dioxide fire-extinguishing system, and obtain approval from authorities having jurisdiction.
 1. Total-Flooding System Design Criteria:
 - a. Hazard Type: [Data-processing center][Manufacturing process][Power generation][Telecommunications center][Electrical equipment room]<Insert hazard type>.
 - b. Discharge carbon dioxide for [60 seconds]<Insert time> and maintain [34]<Insert number> percent concentration by volume at 70 deg F (21 deg C) for [10-minute]<Insert time> holding time in hazard areas.
 - c. Provide system with separate zones above and below the ceiling [and beneath the raised floor].
 - d. Operations and Controls: Discharge extinguishing agent in the underfloor zone only if smoke is detected below the raised floor. Discharge extinguishing agent in zones above and below the ceiling, and below the floor if smoke is detected below the ceiling. Discharge extinguishing agent only in the zone above the ceiling if smoke is detected above the ceiling.
 2. Local-Application System Design Criteria:
 - a. Single zone with an individual nozzle protecting indicated hazard surface.
 - b. Determine discharge rate by the listing information on the nozzle and as recommended by the fire-extinguishing system manufacturer.
 3. High-Pressure Piping Design Criteria:
 - a. Comply with ASME B31.1.
 - b. Internal Pressure: 2800 psig (19 306 kPa).
- B. Seismic Performance: Cylinder racks, supports, hangers, and braces shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.



1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[, **and the system will be fully operational after the seismic event**]."
2. Component Importance Factor is **[1.5][1.0]**.

C. System Design: Design high-pressure, carbon-dioxide fire-extinguishing system, and obtain approval from authorities having jurisdiction. Design system for **<Insert hazard type>** as appropriate for areas being protected, and include safety factor.

2.2 SYSTEM DESCRIPTION

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
2. **[Fike Corporation]**
3. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
2. **[Fike Corporation]**
3. **<Insert manufacturer's name>**

C. Total-Flooding System: Pre-engineered carbon-dioxide fire-extinguishing system designed for total flooding of the hazard area, including the room cavity above the ceiling, below the ceiling, and below the raised floor.

D. Local Application: Pre-engineered carbon-dioxide fire-extinguishing system designed for local application directly on indicated hazards and adjacent areas.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. NFPA Compliance: Fire-extinguishing system, equipment, and components shall comply with NFPA 12.

G. FM Global Compliance: Provide components that are FM Approved and that are listed in FM's "Approval Guide."

H. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

2.3 CARBON DIOXIDE

A. Vapor Phase: Equal to or more than 99.5 percent carbon dioxide.

B. Taste and Odor: None detectable.

C. Water Content: Comply with CGA G-6.2.

- D. Oil Content: Equal to or less than 10 ppm by weight.

2.4 PIPES AND FITTINGS

- A. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 12, Section "Distribution," for charging pressure of system.
- B. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40, **[Type E][Type S]** or ASTM A106/A106M, **[Grade A][Grade B][Grade C]**, **[black][and][galvanized]** finish, seamless-steel pipe.
1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 2. Welding Fittings: ASME B16.9.
 3. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
 4. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.
 5. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Stainless Steel Pipe: ASTM A269/A269M or ASTM A312/A312M, **[Grade TP304][Grade TP316][Grade TP304L][or][Grade TP316L]**.
1. Stainless Steel Fittings: ASTM A182/A182M, Class 3000.

2.5 HIGH-PRESSURE FLEXIBLE-HOSE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- C. Description: Teflon-lined, braided hose with stainless steel wire-braid covering.
1. Design Standard: ASME B31.1.
 2. Burst Pressure: **5000 psi (34 474 kPa)** minimum.
 3. End Connections: Threaded male couplings.

2.6 CARBON-DIOXIDE CYLINDERS

- A. Operating Pressure: Between **2400 psi (16 547 kPa)** and **3000 psi (20 684 kPa)**.
 - 1. Pressure Relief Device: Rupture-disk type.
 - a. Sized and fitted according to 49 CFR 178.
- B. Ambient Storage Conditions: Less than **120 deg F (49 deg C)** and more than **32 deg F (0 deg C)**.
- C. Wall Storage Racks: Fabricate racks with chain restraints for upright cylinders, as indicated, or provide equivalent manufactured wall racks.
- D. Freestanding Storage Racks: Fabricate racks, as indicated, or provide equivalent manufactured storage racks.
- E. Storage Cylinder Nominal Size: **[50 lb (23 kg)][75 lb (34 kg)][100 lb (45 kg)]<Insert weight>**.
- F. Containers:
 - 1. Minimum Manufacturing Standard: ASME Boiler & Pressure Vessel Code, Section VIII, Division 1.
 - 2. Housing: **[Steel][or][fiberglass]**.
 - 3. Working Pressure: **363 psi (2503 kPa)**.
 - 4. Maintenance Pressure Requirements: **300 psi (2068 kPa)** and **0 deg F (minus 18 deg C)** with a design pressure of **325 psi (2241 kPa)**.
 - 5. Bulk System Storage Container Nominal Size: **[3/4 ton (680 kg)][2 tons (1814 kg)][10 tons (9070 kg)]<Insert weight>**.
 - 6. Mini-Bulk System Storage Container Nominal Size: **[800 lb (363 kg)][1000 lb (454 kg)][1500 lb (680 kg)]<Insert weight>**.

2.7 CYLINDER VALVES

- A. Bursting Pressure Rating:
 - 1. Valves under Constant Pressure: **6000 psi (41 369 kPa)**.
 - 2. Valves Not under Constant Pressure: **5000 psi (34 474 kPa)**.
- B. Discharge Valves:
 - 1. Actuation: **[Pneumatic][Electric][Manual]**.
 - 2. Solenoid Actuator: **[12-V dc][24-V dc]**.
 - 3. Pilot Hose: **[Rigid][Flexible]**.
 - 4. Valve Material: Brass or stainless steel.
 - 5. Slave Valve Material: Brass.
 - 6. Lock-Out: Key-operation selector, for prevention of discharge during maintenance.

2.8 DISTRIBUTION VALVES

- A. Selector Valve:

1. Actuation: Pneumatic, electro pneumatic, or manual.
2. Design: **[Ball][Butterfly]**, with spring-return actuator.
 - a. Minimum Burst Pressure: **5000 psi (34 474 kPa)**.
 - b. Minimum Pressure without Permanent Distortion: **1800 psi (12 411 kPa)**.

B. Master Valve:

1. Actuation: Pneumatic, electro pneumatic, or manual.
2. Design: **[Ball][butterfly]**, with spring-return actuator.
 - a. Minimum burst pressure: **5000 psi (34 474 kPa)**.
 - b. Minimum pressure without permanent distortion: **1800 psi (12 411 kPa)**.

2.9 DISCHARGE NOZZLES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **<Insert manufacturer's name>**
- C. Equipment manufacturer's standard material of working pressure, size, discharge pattern, and capacity required for application.
- D. Corrosion-resistant metal.
- E. Stamped with orifice size and type.

2.10 HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
 2. Galvanized Metallic Coatings: Pre-galvanized or hot-dip galvanized.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod with compatible nuts and washers made of **[carbon steel][stainless steel]<Insert material>**.
- B. Stainless Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support



- bearing surface of piping.
3. Hanger Rods: Continuous-thread rod with compatible nuts and washers made of stainless steel.

2.11 FIRE-CONTROL PANELS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- C. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction, including equipment and features required for testing, supervising, and operating fire-extinguishing system.
- D. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.
- E. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 1. Mounting: **[Recessed flush with surface][Surface]**.
- F. Supervised Circuits: Separate circuits for each independent hazard area.
 1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
 2. Manual pull-station circuit.
 3. Alarm circuit.
 4. Release circuit.
 5. Abort circuit.
 6. Emergency power-off circuit.
- G. Control-Panel Features:
 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 2. Automatic switchover to standby power at loss of primary power.
 3. Storage container, low-pressure indicator.
 4. Service disconnect to interrupt system operation for maintenance, with visual status indication on the annunciator panel.
- H. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of

detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless steel or aluminum enclosure.

- I. Standby Power: **[Sealed lead calcium][Sealed, valve-regulated, recombinant lead acid][Vented, wet-cell pocket, plate nickel cadmium]** batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high, depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.12 DETECTION DEVICES

A. General Requirements for Detection Devices:

1. Comply with NFPA 12, NFPA 72, and UL 268.
2. 24-V dc, nominal.

B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.

C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.

D. Remote Air-Sampling Detector System: Include air-sampling pipe network, laser-based photoelectric detector, sample transport fan, and control unit.

1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of **0.05 inch wg (12.5 Pa)** at all sampling ports.
4. Control Unit: Multizone unit as indicated on Drawings. Include same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.
5. Signals to the Central Fire-Alarm Control Panel: Report local system trouble to the central fire-alarm control panel as a composite "trouble" signal. Individually report alarms on each system zone to the central fire-alarm control panel as separately identified zones.

2.13 MANUAL STATIONS

A. Description: **[Surface][Semirecessed]**, FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

B. Manual Release: "MANUAL RELEASE" caption, with red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.

C. Emergency Power-Off Switch: "EPO" caption, with yellow finish.

2.14 SWITCHES

A. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction.



1. Control Voltage: [**120-V ac**]<Insert electrical rating> compatible with controls.
2. Include contacts for connection to control panel.
3. Discharge Pressure Switches: Pneumatic operation for shutdown of equipment.
4. Power-Transfer Switches: Key-operation selector for transfer of release circuit signal from main supply to reserve supply.
5. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.15 ALARM DEVICES

- A. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction; low voltage and surface mounting.
- B. Bells: Minimum **6-inch (150-mm)** diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with requirements in NFPA 12.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of gas piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system

pressure rating.

- H. Install piping to permit valve servicing.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and for branch connections.
- K. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 12, Section "Distribution Systems."
 - 1. Install pressure-relief devices in piping systems.
 - 2. Install seismic restraints for carbon-dioxide cylinders and piping systems.
 - 3. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 12, Section "Detection, Actuation, and Control," as required for supervised system application.
- L. Install carbon-dioxide cylinders in racks anchored to substrate.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for vibration isolation devices **[and seismic restraints]**.
- B. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- C. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **[NPS 2-1/2 (DN 65)]<Insert size>** and larger, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.
- F. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- G. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes to facilitate draining moisture and to not exceed maximum pipe deflections allowed by ASME B31.9 for building-services piping.
- H. Install carbon-steel hangers and supports for steel piping and stainless steel hangers and supports for stainless steel piping.
- I. Vertical Piping: MSS Type 8 or 42 clamps.
- J. Individual, Straight, Horizontal Piping Runs:
 - 1. **100 Feet (30 m) and Less:** MSS Type 1, adjustable, steel, clevis hangers.
 - 2. **Longer Than 100 Feet (30 m):** MSS Type 43, adjustable, roller hangers.

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- K. Base of Vertical Piping: MSS Type 52 spring hangers.
- L. Support horizontal piping within **12 inches (300 mm)** of each fitting and coupling.
- M. Support vertical runs of piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- N. Install hangers with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- O. Install seismic restraints on piping. Comply with requirements in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

3.4 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.
- C. Piping Connections for **NPS 1/4 to 1/2 (DN 6 to DN 12)**: Braided stainless steel hose with threaded male couplings.

3.5 ELECTRICAL CONNECTIONS

- A. Connect electrical devices to control panel. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

3.6 CONTROL CONNECTIONS

- A. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.7 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."

- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 12.
- D. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected by a carbon-dioxide fire-extinguishing system.
- E. Install signs at entry doors to advise persons outside the room of the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections according to NFPA 12[**with the assistance of a factory-authorized service representative**]:
 - 1. Visual Inspections:
 - a. Inspect piping, equipment, and nozzles for proper size and location.
 - b. Verify that locations of alarms and manual emergency releases comply with approved Drawings.
 - c. Compare actual hazard configuration to original specification.
 - d. Inspect system for openings or other possible leakage paths.
 - e. Inspect labeling of devices and equipment for proper identification and nameplate data.
 - 2. Testing: After installing carbon-dioxide fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - a. Perform nondestructive operational tests on all equipment.
 - b. Perform full-discharge test on all hazards.
 - c. Perform each electrical test and visual and mechanical inspection stated in NETA's "Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems," Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
 - d. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - e. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
 - f. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Carbon-dioxide fire-extinguishing system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 SYSTEM FILLING

- A. Preparation:
 - 1. Verify that piping system installation is complete and clean.
 - 2. Check system for complete enclosure integrity.
 - 3. Check operation of ventilation and exhaust systems.



B. Filling Procedures:

1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled extinguishing-agent containers.
3. Energize circuits.

C. Adjust operating controls.

3.10 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **[three][six][nine][12]** months' full maintenance by **[skilled employees of carbon-dioxide system Installer][manufacturer's authorized service representative]**. Include **[monthly][quarterly][semiannual][annual]** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper carbon-dioxide fire-extinguishing system operation. Service to include manufacturer's authorized replacement parts and supplies.

3.11 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain carbon-dioxide fire-extinguishing system.

END OF SECTION 21 21 00 00

SECTION 21 21 00 00A - LOW-PRESSURE, CARBON-DIOXIDE FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low-pressure, carbon-dioxide fire-extinguishing systems.
2. Low-pressure flexible-hose connectors.
3. Discharge nozzles.
4. Fire-control panel.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For low-pressure, carbon-dioxide fire-extinguishing system, signed and sealed by a qualified professional engineer.

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittals: For low-pressure, carbon-dioxide fire-extinguishing system, signed and sealed by a qualified professional engineer.

1. Indicate compliance with performance requirements and design criteria, including analysis data.
2. Design Calculations: For weight, volume, and concentration of extinguishing agent required for each hazard area.
3. Reflected Ceiling Plans:
 - a. Show ceiling penetrations.
 - b. Ceiling-mounted carbon-dioxide fire-extinguishing system items.
 - c. Extinguishing-agent containers if mounted above floor.
 - d. Piping, discharge nozzles, detectors, and accessories.
 - e. Hangers and supports, including hanger types and spacing and methods for attaching hangers to building structure.
 - f. Coordination with items mounted in and above ceiling other than carbon-dioxide fire-extinguishing systems, including ceiling construction components.
4. Occupied Work Area Plans:
 - a. Controls and alarms.



- b. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
- c. Coordination with equipment and furnishings protected by the system.

5. Access Floor Space Plans:

- a. Extinguishing-agent containers, piping, discharge nozzles, detectors, and accessories.
- b. Method of supporting piping.

1.3 INFORMATIONAL SUBMITTALS

A. Design Data:

- 1. Permit-Approved Drawings: Working plans including design calculations prepared according to NFPA 12, that have been approved by authorities having jurisdiction.

B. Seismic Qualification Data: Certificates, for container foundations, container racks, supports, hangers, braces, accessories, and components, from manufacturer.

- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity, and locate and describe mounting and anchorage provisions.
- 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Contracts:

- 1. Maintenance service agreement.

B. Operation and Maintenance Data: For carbon-dioxide fire-extinguishing system to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

- 1. Detection Devices: Not less than [20]<Insert number> percent of amount of each type installed.
- 2. Container Valves: Not less than [10]<Insert number> percent of amount of each size and type installed.
- 3. Nozzles: Not less than [20]<Insert number> percent of amount of each type installed.
- 4. Extinguishing Agent: Not less than [100]<Insert number> percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design a low-pressure, carbon-dioxide fire-extinguishing system, and obtain approval from authorities having jurisdiction.
 - 1. Total-Flooding System Design Criteria:
 - a. Hazards: **[Printing presses][Transformer vaults][Rolling mills][Open pits][Dip tanks][Manufacturing process][Power generation][Telecommunications center][Electrical equipment room]<Insert hazard type>**.
 - b. Discharge carbon dioxide for **[60 seconds]<Insert time>** and maintain **[34]<Insert number>** percent concentration by volume at **70 deg F (21 deg C)** for **[10-minute]<Insert time>** holding time in hazard areas.
 - c. Provide system with separate zones above and below the ceiling **[and beneath the raised floor]**.
 - d. Operations and Controls: Discharge extinguishing agent in the underfloor zone only if smoke is detected below the raised floor. Discharge extinguishing agent in zones above and below the ceiling, and below the floor if smoke is detected below the ceiling. Discharge extinguishing agent only in the zone above the ceiling if smoke is detected above the ceiling.
 - 2. Local-Application System Design Criteria:
 - a. Single zone with an individual nozzle protecting indicated hazard surface.
 - b. Determine discharge rate by the listing information on the nozzle and as recommended by the fire-extinguishing system manufacturer.
 - 3. Low-Pressure Piping Design Criteria:
 - a. Comply with ASME B31.1.
 - b. Internal Pressure: **[750 psig (5171 kPa)][300 psig (2068 kPa)]**.
- B. Seismic Performance: Container foundations, supports, hangers, and braces to withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified, **and the system will be fully operational after the seismic event**."
 - 2. Component Importance Factor is **[1.5][1.0]**.
- C. System Design: Design low-pressure, carbon-dioxide fire-extinguishing system, and obtain approval from authorities having jurisdiction. Design system for **<Insert hazard type>** as appropriate for areas being protected, and include safety factor.



2.2 LOW-PRESSURE, CARBON-DIOXIDE FIRE-EXTINGUISHING SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - 2. **[Victaulic Company]**
 - 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - 2. **[Victaulic Company]**
 - 3. **<Insert manufacturer's name>**
- C. Total-Flooding System: Pre-engineered carbon-dioxide fire-extinguishing system designed for total flooding of the hazard area, including the room cavity above the ceiling, below the ceiling, and below the raised floor.
- D. Local Application: Pre-engineered carbon-dioxide fire-extinguishing system designed for local application directly on indicated hazards and adjacent areas.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. NFPA Compliance: Fire-extinguishing system, equipment, and components to comply with NFPA 12.
- G. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Approvals' "Approval Guide."
- H. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

2.3 CARBON DIOXIDE

- A. Vapor Phase: Equal to or more than 99.5 percent carbon dioxide.
- B. Taste and Odor: None detectable.
- C. Water Content: Comply with CGA G-6.2.
- D. Oil Content: Equal to or less than 10 ppm by weight.

2.4 PIPES AND FITTINGS

- A. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 12, Section "Distribution," for charging pressure of system.
- B. Steel Pipe: ASTM A53/A53M, Schedule 40, Grade B, **[Type E][Type S]** or ASTM A106/A106M, **[Grade A][Grade B][Grade C]**, **[black][and][galvanized]** finish, seamless-steel pipe.

1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300.
 2. Welding Fittings: ASME B16.9.
 3. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
 4. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.
 5. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Stainless Steel Pipe: ASTM A269/A269M or ASTM A312/A312M, **[Grade TP304][Grade TP316][Grade TP304L][or][Grade TP316L]**.
1. Stainless Steel Fittings: ASTM A182/A182M, Class 2000.
 - a. Threaded: **[Type 304][or][Type 316]**.
 - b. Welded: **[Type 304][Type 316][Type 304L][or][Type 316L]**.

2.5 LOW-PRESSURE FLEXIBLE-HOSE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 2. **[Fike Corporation]**
 3. **<Insert manufacturer's name>**
- C. Description: Teflon-lined, braided hose with stainless steel wire-braid covering.
1. Design Standard: ASME B31.1.
 2. Internal Pressure: **450 psi (3101 kPa)**.
 3. Burst Pressure: **1800 psi (12 411 kPa)** minimum.
 4. End Connections: Threaded male couplings.

2.6 CARBON-DIOXIDE CYLINDERS

- A. Operating Pressure: Between **300 psi (2068 kPa)** and **325 psi (2241 kPa)**.
1. Pressure Relief Device: Rupture-disk type.

- a. Sized and fitted according to 49 CFR 178.
- B. Ambient Storage Conditions: Less than **120 deg F (49 deg C)** and more than **32 deg F (0 deg C)**.
- C. Wall Storage Racks: Fabricate racks with chain restraints for upright cylinders, as indicated, or provide equivalent manufactured wall racks.
- D. Freestanding Storage Racks: Fabricate racks, as indicated, or provide equivalent manufactured storage racks.
- E. Storage Cylinder Nominal Size: **[50 lb (23 kg)][75 lb (34 kg)][100 lb (45 kg)]<Insert weight>**.
- F. Containers:
 - 1. Minimum Manufacturing Standard: ASME Boiler & Pressure Vessel Code, Section VIII, Division 1.
 - 2. Housing: **[Steel][or][fiberglass]**.
 - 3. Working Pressure: **363 psi (2503 kPa)**.
 - 4. Maintenance Pressure Requirements: **300 psi (2068 kPa)** and **0 deg F (minus 18 deg C)** with a design pressure of **325 psi (2241 kPa)**.
 - 5. Bulk System Storage Container Nominal Size: **[3/4 ton (680 kg)][2 tons (1814 kg)][10 tons (9070 kg)]<Insert weight>**.
 - 6. Mini-Bulk System Storage Container Nominal Size: **[800 lb (363 kg)][1000 lb (454 kg)][1500 lb (680 kg)]<Insert weight>**.

2.7 CYLINDER VALVES

- A. Manual Shutoff Valve:
 - 1. Bleeder Valve: **[341 psi (2352 kPa)]<Insert pressure>**.
 - 2. Relief Valve: **[357 psi (2462 kPa)]<Insert pressure>**.
- B. Gauges:
 - 1. Liquid level.
 - 2. Pressure.
- C. High- and Low-Pressure Supervisory Alarm:
 - 1. Maximum Pressure Set Point: 90 percent of allowable working pressure.
 - 2. Minimum Pressure Set Point: **250 psi (1724 kPa)**.
- D. Refrigeration System:
 - 1. Maintenance Pressure: **300 psi (2068 kPa)** at maximum expected temperature.
 - 2. Pressure Switch:
 - a. Start Pressure: **295 psi (2034 kPa)**.
 - b. Stop Pressure: **305 psi (2103 kPa)**.
 - 3. Compressor: Commercial grade.
 - 4. Refrigeration Coil Location: Lengthwise near top.

5. Motor:
- a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 210500 "Common Work Results for Fire Suppression."
 - b. Efficiency: Premium efficient.
 - c. Electrical Characteristics:
 - 1) Horsepower: [1][1-1/2][3]<Insert number> hp.
 - 2) Volts: [120][208][230][460]<Insert number> V.
 - 3) Phase: [Single][Poly].
 - 4) Hertz: 60.
 - 5) Full-Load Amperes: <Insert number> A.
 - 6) Minimum Circuit Ampacity: <Insert number> A.
 - 7) Maximum Overcurrent Protection: <Insert number> A.

E. Heating System:

1. Maintenance Temperature: **32 deg F (0 deg C)** at minimum expected temperature.

2.8 DISTRIBUTION VALVES

A. Selector Valve:

1. Actuation: Pneumatic, electro pneumatic, or manual.
2. Design: [Ball][Butterfly], with spring-return actuator.
 - a. Minimum Burst Pressure: **5000 psi (34 474 kPa)**.
 - b. Minimum Pressure without Permanent Distortion: **1800 psi (12 411 kPa)**.

B. Master Valve:

1. Actuation: Pneumatic, electro pneumatic, or manual.
2. Design: [Ball][butterfly], with spring-return actuator.
 - a. Minimum burst pressure: **5000 psi (34 474 kPa)**.
 - b. Minimum pressure without permanent distortion: **1800 psi (12 411 kPa)**.

2.9 DISCHARGE NOZZLES

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
2. [Kidde; Carrier Global Corporation]
3. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
2. [Kidde; Carrier Global Corporation]

3. <Insert manufacturer's name>

- C. Equipment manufacturer's standard material of working pressure, size, discharge pattern, and capacity required for application.
- D. Corrosion-resistant metal.
- E. Stamped with orifice size and type.

2.10 HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

- 1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
- 2. Galvanized Metallic Coatings: Pre-galvanized or hot dip-galvanized.
- 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
- 5. Hanger Rods: Continuous-thread rod with compatible nuts and washers made of [carbon steel][stainless steel]<Insert material>.

B. Stainless Steel Pipe Hangers and Supports:

- 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
- 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
- 3. Hanger Rods: Continuous-thread rod with compatible nuts and washers made of stainless steel.

2.11 FIRE-CONTROL PANEL

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
- 2. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
- 2. <Insert manufacturer's name>

C. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

D. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

- E. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 - 1. Mounting: **[Recessed flush with surface][Surface]**.
- F. Supervised Circuits: Separate circuits for each independent hazard area.
 - 1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
 - 2. Manual pull-station circuit.
 - 3. Alarm circuit.
 - 4. Release circuit.
 - 5. Abort circuit.
 - 6. Emergency power-off circuit.
- G. Control-Panel Features:
 - 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 - 2. Automatic switchover to standby power at loss of primary power.
 - 3. Storage container, low-pressure indicator.
 - 4. Service disconnect to interrupt system operation for maintenance, with visual status indication on the annunciator panel.
- H. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless steel or aluminum enclosure.
- I. Standby Power: **[Sealed lead calcium][Sealed, valve-regulated, recombinant lead acid][Vented, wet-cell pocket, plate nickel cadmium]** batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high, depending on battery voltage and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.12 DETECTION DEVICES

- A. General Requirements for Detection Devices:
 - 1. Comply with NFPA 12, NFPA 72, and UL 268.
 - 2. 24-V dc, nominal.
- B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.
- C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.
- D. Remote Air-Sampling Detector System: Include air-sampling pipe network, laser-based photoelectric detector, sample transport fan, and control unit.
 - 1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
 - 2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
 - 3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of **0.05 inch wg (12.5 Pa)** at all sampling ports.
 - 4. Control Unit: Multizone unit as indicated on Drawings. Include same system power supply,



supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.

5. Signals to the Central Fire-Alarm Control Panel: Report local system trouble to the central fire-alarm control panel as a composite "trouble" signal. Individually report alarms on each system zone to the central fire-alarm control panel as separately identified zones.

2.13 MANUAL STATIONS

- A. Description: **[Surface][Semi-recessed]**, FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, with red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Emergency Power-Off Switch: "EPO" caption, with yellow finish.

2.14 SWITCHES

- A. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction.
 1. Control Voltage: **[120-V ac]<Insert electrical rating>** compatible with controls.
 2. Include contacts for connection to control panel.
 3. Discharge Pressure Switches: Pneumatic operation for shutdown of equipment.
 4. Power-Transfer Switches: Key-operation selector for transfer of release circuit signal from main supply to reserve supply.
 5. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.15 ALARM DEVICES

- A. Description: FM Approved or listed and labeled by a nationally recognized testing agency acceptable to authorities having jurisdiction; low voltage and surface mounting.
- B. Bells: Minimum **6-inch (150-mm)** diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with requirements in NFPA 12.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of gas piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating.
- H. Install piping to permit valve servicing.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and for branch connections.
- K. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 12, Section "Distribution Systems."
 - 1. Install pressure-relief devices in piping systems.
 - 2. Install seismic restraints for carbon-dioxide containers and piping systems.
 - 3. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 12, Section "Detection, Actuation, and Control," as required for supervised system application.
- L. Install dirt trap, minimum **2 inches (51 mm)** long, with capped nipple at end of each pipe run.
- M. Install carbon-dioxide containers in racks anchored to substrate.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for vibration isolation devices[**and seismic restraints**].
- B. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- C. Equipment Support Installation: Fabricate from welded-structural-steel shapes.



- D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **[NPS 2-1/2 (DN 65)]<Insert size>** and larger, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- F. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- G. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes to facilitate draining moisture and to not exceed maximum pipe deflections allowed by ASME B31.9 for building-services piping.
- H. Install carbon-steel hangers and supports for steel piping and stainless steel hangers and supports for stainless steel piping.
- I. Vertical Piping: MSS Type 8 or 42 clamps.
- J. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel, clevis hangers.
 - 2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable, roller hangers.
- K. Base of Vertical Piping: MSS Type 52 spring hangers.
- L. Support horizontal piping within **12 inches (300 mm)** of each fitting and coupling.
- M. Support vertical runs of piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- N. Install seismic restraints on piping. Comply with requirements in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

3.4 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.
- C. Piping Connections for NPS 1/4 to NPS 1/2 (DN 6 to DN 12): Braided stainless steel hose with threaded male couplings.

3.5 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power wiring.
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least **1/2 inch (13 mm)** high.

3.6 CONTROL CONNECTIONS

- A. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.7 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 12.
- D. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected by a carbon-dioxide fire-extinguishing system.
- E. Install signs at entry doors to advise persons outside the room of the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections according to NFPA 12[**with the assistance of a factory-authorized service representative**]:
 - 1. Visual Inspections:
 - a. Inspect piping, equipment, and nozzles for proper size and location.
 - b. Verify that locations of alarms and manual emergency releases comply with approved Drawings.
 - c. Compare actual hazard configuration to original specification.
 - d. Inspect system for openings or other possible leakage paths.
 - e. Inspect labeling of devices and equipment for proper identification and nameplate data.
 - 2. Testing: After installing carbon-dioxide fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - a. Perform nondestructive operational tests on all equipment.
 - b. Perform full-discharge test on all hazards.
 - c. Perform each electrical test and visual and mechanical inspection stated in NETA's "Standard for Acceptance Testing Specifications for Electrical Power Equipment and



Systems," Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.

- d. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- e. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- f. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Carbon-dioxide fire-extinguishing system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 SYSTEM FILLING

A. Preparation:

- 1. Verify that piping system installation is complete and clean.
- 2. Check system for complete enclosure integrity.
- 3. Check operation of ventilation and exhaust systems.

B. Filling Procedures:

- 1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
- 2. Install filled extinguishing-agent containers.
- 3. Energize circuits.

C. Adjust operating controls.

3.10 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service to include **[three][six][nine][12]** months' full maintenance by **[skilled employees of carbon-dioxide system Installer][manufacturer's authorized service representative]**. Include **[monthly][quarterly][semiannual][annual]** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper carbon-dioxide fire-extinguishing system operation. Service to include manufacturer's authorized replacement parts and supplies.

3.11 DEMONSTRATION

A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain carbon-dioxide fire-extinguishing system.

END OF SECTION 21 21 00 00A



21 - Fire Suppression

Task	Specification	Specification Description
21 21 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 21 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 21 16 00	21 21 00 00	High-Pressure, Carbon-Dioxide Fire-Extinguishing Systems
21 21 16 00	21 21 00 00a	Low-Pressure, Carbon-Dioxide Fire-Extinguishing Systems



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SECTION 21 22 00 00 - CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Clean-agent systems.
 - 2. Fire-extinguishing clean agent.

1.2 DEFINITIONS

- A. EPO: Emergency Power Off.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: Documentation that clean-agent chemicals are compliant.
- C. Shop Drawings: Prepare in accordance with requirements of NFPA 2001, to include, but not be limited to, the following:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include design calculations.
 - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, manufacturer-required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Include diagrams for power, signal, and control wiring.
 - 5. Permit-Approved Documents: Working plans and hydraulic calculations approved by authorities having jurisdiction.
- D. Delegated-Design Submittal: For clean-agent fire-extinguishing systems indicated to comply with performance and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades. Coordinate for enclosure integrity in accordance with NFPA 2001 requirements.
- B. Seismic Qualification Data: Certificates for extinguishing-agent containers and control panels, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of



- assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For clean-agent fire-extinguishing system to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
- 1. Detection Devices: Not less than [20]<Insert number> percent of amount of each type installed.
 - 2. Container Valves: Not less than [10]<Insert number> percent of amount of each size and type installed.
 - 3. Nozzles: Not less than [20]<Insert number> percent of amount of each type installed.
 - 4. Extinguishing Agent: Not less than [100]<Insert number> percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.7 QUALITY ASSURANCE

- A. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Approvals' "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."
- D. Seismic Performance: Fire-suppression piping shall withstand the effects of earthquake motions determined in accordance with [NFPA 13][and][ASCE/SEI 7]<Insert requirement>.
- 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified **and the unit will be fully operational**

- after the seismic event]."
2. Component Importance Factor: [1.5][1.0].
3. <Insert requirements for Component Amplification Factor and Component Response Modification Factor>.

2.2 CLEAN-AGENT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
 2. [Fike Corporation]
 3. [Kidde; Carrier Global Corporation]
 4. [Siemens Industry, Inc., Building Technologies Division]
 5. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
 2. [Fike Corporation]
 3. [Kidde; Carrier Global Corporation]
 4. [Siemens Industry, Inc., Building Technologies Division]
 5. <Insert manufacturer's name>
- C. Source Limitations: Obtain clean-agent systems from single source from single manufacturer.
- D. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity above the ceiling, below the ceiling, and below the raised floor. System includes separate zones above and below the ceiling and beneath the raised floor. If smoke is detected below the raised floor, extinguishing agent shall be discharged in the underfloor zone only. If smoke is detected below the ceiling, extinguishing agent shall be discharged in zones above and below the ceiling and below the floor. If smoke is detected above the ceiling, extinguishing agent shall be discharged in the zone above the ceiling only.
- E. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for [Class A][Class B][Class C] fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
- F. Performance Requirements, Discharge HFC 227ea: Within 10 seconds and maintain 7.1 percent concentration by volume at **70 deg F (21 deg C)** for 10-minute holding time in hazard areas.
 1. HFC 227ea concentration in hazard areas greater than [9.0]<Insert number> percent immediately after discharge or less than [5.8]<Insert number> percent throughout holding time will not be accepted without written authorization from Owner and authorities having jurisdiction.
 2. System Capabilities: Minimum **620-psig (4278-kPa)** calculated working pressure and **360-psig (2484-kPa)** initial charging pressure.
- G. Performance Requirements, Discharge FK-5-1-12: Within 10 seconds and maintain 6.6 percent concentration by volume at **70 deg F (21 deg C)** for 10-minute holding time in hazard areas.
 1. FK-5-1-12 concentration in hazard areas greater than [10.0]<Insert number> percent immediately after discharge or less than [6.5]<Insert number> percent throughout holding time



- will not be accepted without written authorization from Owner and authorities having jurisdiction.
2. System Capabilities: Minimum **620-psig (4278-kPa)** calculated working pressure and **360-psig (2484-kPa)** initial charging pressure.
- H. Performance Requirements, Discharge IG-541: Within 60 seconds and maintain 38 percent concentration by volume at **70 deg F (21 deg C)** for 10-minute holding time in hazard areas.
1. IG-541 concentration in hazard areas greater than **[40]<Insert number>** percent immediately after discharge or less than **[32]<Insert number>** percent throughout holding time will not be accepted without written authorization from Owner and authorities having jurisdiction.
 2. System Capabilities: Minimum **2175-psig (15-MPa)** calculated working pressure upstream from orifice union, minimum **1000-psig (6895-kPa)** calculated working pressure downstream from orifice union, and **2175-psig (15-MPa)** initial charging pressure.
- I. Cross-Zoned Detection: Devices located in two separate zones. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating single-detection device in another zone.
- J. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.
- K. System Operating Sequence for **[ionization smoke detectors][or][photoelectric smoke detectors][or][combination of ionization and photoelectric smoke detectors]**:
1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to fire-alarm system.
 2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for **[30]<Insert time>** seconds, and discharge extinguishing agent. **[On agent discharge, release preaction valve to allow water to fill sprinkler system.]**
 3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.
- L. System Operating Sequence: System shall be cross-zoned, air-sampling detectors and photoelectric detectors reporting to a fully programmable microprocessor-based control panel programmed to operate as follows:
1. If one photoelectric detector and air-sampling detector reaches the third detection level (Fire 1), agent discharge will be initiated as described for the third detection level (Fire 1) below.
 2. Air-Sampling System:
 - a. First Detection Level (Alert): Mild audible and visual indication on annunciator panel. Strobe lights flash slowly in the protected area.
 - b. Second Detection Level (Action): Strong audible and visual indication on annunciator panel. Strobe lights flash rapidly in the protected area.
 - c. Third Detection Level (Fire 1): Strong audible and visual indication on annunciator panel. Energize horn(s), bell(s), and strobe light(s) in the protected area and outside entry doors. Shut down air-conditioning and ventilating systems serving the protected area, and close doors in the protected area. Send signal to fire-alarm system, initiate 30-second time delay for extinguishing-agent discharge, and discharge extinguishing agent. At agent discharge, terminate power to equipment in the protected area, **and release preaction valve to allow water flow to sprinkler system]**.
 - d. Fourth Detection Level (Fire 2): Same as Fire 1.

- M. Manual stations shall immediately discharge extinguishing agent when activated.
- N. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release hand pressure on the switch to cause agent discharge after the time delay has expired.
- O. EPO: Will terminate power to protected equipment immediately on actuation.
- P. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.
- Q. Power Transfer Switch: Transfer from normal to standby power source.

2.3 PIPE AND FITTINGS

- A. See **["HFC 227ea Agent Piping Applications"]****["IG-541 Agent Piping Applications"]****["FK-5-1-12 Agent Piping Applications"]** Article for applications of pipe, tube, fitting, and joining materials.
- B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.
- C. Steel Pipe: ASTM A53/A53M, Type S, Grade B or ASTM A106/A106M, **[Grade A]****[and]****[Grade B]**; Schedule 40, Schedule 80, and Schedule 160, seamless steel pipe.
 - 1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 - c. Fittings Working Pressure: **620 psig (4278 kPa)** minimum.
 - d. Flanged Joints: Class 300 minimum.
 - 2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
 - 3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A47/A47M malleable iron or ASTM A536 ductile iron, with dimensions matching steel pipe and ends factory grooved in accordance with AWWA C606.
- D. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch- (3.2-mm-)** maximum thickness unless thickness or specific material is indicated.
- E. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

- A. General Valve Requirements:



1. UL listed or FM Approved for use in fire-protection systems.
2. Compatible with type of clean agent used.

- B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.
- C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.
- D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

- A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.
 1. Finish: **[Red][Manufacturer's standard color]**, enamel or epoxy paint.
 2. Manifold:
 - a. Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
 - b. Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
 3. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

- A. HFC 227ea Clean Agent: Heptafluoropropane.
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[DuPont]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DuPont]**
 - b. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain clean agents from single source from single manufacturer.
- B. FK-5-1-12 Clean Agent: Dodecafluoro-2-methylpentan-3-one.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[3M]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M]**
 - b. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain clean agents from single source from single manufacturer.
- C. IG-541 Clean Agent: Mixture of nitrogen, argon, and carbon dioxide inert gases.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ansul; brand of Johnson Controls International plc, Building Solutions North America]**
 - b. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain clean agents from single source from single manufacturer.

2.7 DISCHARGE NOZZLES

- A. Description: Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.
- B. Material: Corrosion-resistant metal.
- C. Stamped with orifice size and type.

2.8 MANIFOLD AND ORIFICE UNIONS

- A. Description: NRTL-listed device with minimum **2175-psig (15-MPa)** pressure rating, to control flow and reduce pressure of IG-541 gas in piping.
 1. NPS 2 (DN 50) and Smaller: Piping assembly with orifice, sized for system design requirements.

2. NPS 2-1/2 (DN 65) and Larger: Piping assembly with nipple, sized for system design requirements.

2.9 FIRE CONTROL PANELS

- A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.
- B. Power Requirements: 120/240 V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.
- C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 1. Mounting: **[Recessed flush with surface][Surface]**.
- D. Supervised Circuits: Separate circuits for each independent hazard area.
 1. Detection circuits equal to required number of zones, or addressable devices assigned to required number of zones.
 2. Manual pull-station circuit.
 3. Alarm circuit.
 4. Release circuit.
 5. Abort circuit.
 6. EPO circuit.
- E. Control-Panel Features:
 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 2. Automatic switchover to standby power at loss of primary power.
 3. Storage container, low-pressure indicator.
 4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.
- F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless steel or aluminum enclosure.
- G. Standby Power: **[Sealed lead calcium][Sealed, valve-regulated, recombinant lead acid][Vented, wet-cell pocket, plate nickel cadmium]** batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.10 DETECTION DEVICES

- A. Description: Comply with NFPA 2001, NFPA 72, and UL 268; 24 V dc, nominal.
- B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.

- C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.
- D. Remote Air-Sampling Detector System: Includes air-sampling pipe network, laser-based photoelectric detector, sample transport fan, and control unit.
 - 1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
 - 2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
 - 3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of **0.05 inch wg (12.5 Pa)** at all sampling ports.
 - 4. Control Unit: Multizone unit as indicated on Drawings. Provides same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.
- E. Signals to the Central Fire-Alarm Control Panel: Any type of local system trouble is reported to central fire-alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to central fire-alarm control panel as separately identified zones.

2.11 MANUAL STATIONS

- A. Description: **[Surface][Semirecessed]** FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low-voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: "ABORT" caption, momentary contact, with green finish.
- D. EPO Switch: "EPO" caption, with yellow finish.

2.12 SWITCHES

- A. Description: FM Approved or NRTL listed, where available, **[120-V]<Insert value>** ac or low-voltage compatible with controls. Include contacts for connection to control panel.
 - 1. Low-Agent Pressure Switches: Pneumatic operation.
 - 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
 - 3. Door Closers: Magnetic retaining and release device or electrical interlock to cause door operator to drive the door closed.

2.13 ALARM DEVICES

- A. Description: FM Approved or NRTL listed, low voltage, and surface mounting. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems" for alarm and monitoring devices.
- B. Bells: Minimum **6-inch (150-mm)** diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

- E. Oxygen Deficiency Monitor.
 - 1. Sampling Method and Range: Diffusion, zero to 25 percent O₂.
 - 2. 24 V dc.
 - 3. Wall mounted with bracket.
 - 4. Built-in audible alarm 90 dBA.
 - 5. Backlit LCD.
 - 6. 10-year no-calibration sensor.
 - 7. No maintenance required.
 - 8. Signal Outputs: Standard 4- to 20-mA analog.
 - 9. Connections for system control data acquisition system and/or programmable logic controller.
 - 10. Plus or minus 1 percent accuracy of full scale.
 - 11. Operating temperature of **minus 40 to plus 122 deg F (minus 40 to plus 50 deg C)**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with enclosure integrity requirements, installation tolerances, and other conditions affecting performance of the Work in accordance with NFPA 2001.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HFC 227ea AGENT PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 (DN 50) and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.
- C. NPS 2-1/2 (DN 65) and Larger: Schedule 40, steel pipe; **[forged-steel welding fittings; and welded][steel, grooved-end fittings; steel, keyed couplings; and grooved]** joints.

3.3 IG-541 AGENT PIPING APPLICATIONS

- A. Piping between Storage Containers and Orifice Union: Schedule **[80][160]**, steel pipe; **[forged-steel welding fittings; and welded][malleable-iron fittings with threaded or flanged]** joints.
- B. Piping Downstream from Orifice Union: Schedule **[40][80]**, steel pipe; **[forged-steel welding fittings; and welded][malleable-iron fittings with threaded or flanged]** joints.

3.4 FK-5-1-12 AGENT PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 (DN 50) and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded

joints.

- C. NPS 2-1/2 (DN 65) and Larger: Schedule 40, steel pipe; **[forged-steel welding fittings; and welded][steel, grooved-end fittings; steel, keyed couplings; and grooved]** joints.

3.5 CLEAN-AGENT SYSTEM INSTALLATION

- A. Install clean-agent containers, piping, and other components level and plumb, in accordance with manufacturers' written instructions.
- B. Clean-Agent Container Mounting:
 - 1. Install clean-agent containers on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
 - 3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
- C. Grooved Piping Joints: Groove pipe ends in accordance with AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant in accordance with manufacturer's written instructions.
- D. Install pipe and fittings, valves, and discharge nozzles in accordance with requirements listed in NFPA 2001, Section "Distribution."
 - 1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
 - 2. Support piping using supports and methods in accordance with NFPA 13.
 - 3. Install seismic restraints for extinguishing-agent piping systems.
 - 4. Install control panels, detection system components, alarms, and accessories, in accordance with requirements listed in NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.6 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.7 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit

number feeding connection.

- E. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems."

3.8 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.9 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."
- B. Identify piping, extinguishing-agent containers, other equipment, and panels in accordance with NFPA 2001.
- C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.
- D. Install signs at entry doors to advise persons outside the room the meaning of horn(s), bell(s), and strobe light(s) outside the protected space.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]**.
- D. Tests and Inspections:
 - 1. After installing clean-agent fire-extinguishing system and after electrical circuitry has been energized, test for compliance in accordance with requirements listed in NFPA 2001, Section "Approval of Installation."
 - 2. Clean-agent fire-extinguishing system and associated protected enclosure will be considered defective if either does not pass required tests and inspections.
 - 3. Prepare test and inspection reports in accordance with requirements listed in NFPA 2001, Section "Installation Acceptance."

3.11 CLEANING

- A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and

oil residue before installing nozzles or discharge devices.

3.12 OPERATIONAL CONDITION SYSTEM FILLING

A. Preparation:

1. Verify that clean-agent fire-extinguishing system and protected enclosure have passed all required tests and inspections in accordance with NFPA 2001.
2. Verify that clean-agent fire-extinguishing piping system installation is completed and cleaned.
3. Verify complete enclosure integrity.
4. Verify operation of ventilation and exhaust systems.

B. Filling Procedures:

1. Fill clean-agent fire-extinguishing containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled containers.
3. Energize circuits.
4. Adjust operating controls.

3.13 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 21 22 00 00



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Task	Specification	Specification Description
21 22 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 22 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 22 16 00	21 22 00 00	Clean-Agent Fire-Extinguishing Systems
21 23 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 23 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 24 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 24 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 30 00 00	01 91 13 00a	Commissioning Of Fire Suppression
21 30 00 00	21 31 13 00	Electric-Drive, Centrifugal Fire Pumps
21 30 00 00	21 31 16 00	Diesel-Drive, Centrifugal Fire Pumps
21 31 00 00	01 91 13 00a	Commissioning Of Fire Suppression



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SECTION 21 31 13 00 - ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire pumps - electric drive.
2. Fire-pump controllers - electric drive.
3. Fire-pump accessories and specialties.
4. Fire-pump controller remote alarm panels.
5. Grout.

B. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on Project.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on Project.
3. Section 210548 "Vibration and Seismic Controls for Fire Suppression Systems" specifies seismic restraint and vibration isolation of fire suppression equipment and piping.
4. Section 260010 "Supplemental Requirements for Electrical" specifies requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.
5. Section 260573 "Power System Studies" specifies arc flash hazard analyses and arc flash hazard labeling.
6. Section 284600 "Fire-Detection and Alarm" specifies supervisory connections to fire-alarm system.

1.2 DEFINITIONS

- A. PID:** Proportional integral derivative.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire pump and fire-pump controller.
2. Include rated capacities, operating characteristics, factory-certified performance test curves, electrical characteristics, and furnished accessories and specialties.

B. Shop Drawings: For packaged fire-pump and electric-drive, fire-pump controller and fire-pump accessories and specialties.

1. Provide fabrication and installation details including plans, elevations, sections, and mounting and attachment details.
2. Provide details of equipment assemblies. Indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical

- characteristics; and location and size of each field connection.
- 3. Provide wiring diagrams for power, signal, and control wiring.
- 4. For fire pump controllers, show the following:
 - a. Each installed unit's type and details.
 - b. Enclosure types and details for types other than NEMA 250, Type 2.
 - c. Factory-installed devices.
 - d. Nameplate legends.
 - e. Short-circuit current rating of integrated unit.
 - f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
 - g. Specified modifications.
- C. Delegated Design Submittals: For fire pump and fire-pump controller.
 - 1. Include design calculations for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For fire pumps, controllers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of fire pump and fire-pump controller, from manufacturer.
- C. Source quality control reports.
- D. Field acceptance testing and inspection reports for fire-pump controllers.
- E. Field quality control reports.
- F. Certified shop test curves showing head capacity and brake horsepower for each pump.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire pumps and fire-pump controllers to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match fire-pump controllers installed and that are packaged with protective coverings for storage and identified with labels describing contents.
 - 1. Auxiliary Contacts: [**One**]**<Insert number>** for each size and type of magnetic contactor installed.

2. Power Contacts: **[Three]<Insert number>** for each size and type of magnetic contactor installed.
3. Contactor Coils: **[One]<Insert number>** for each size and type of magnetic controller installed.
4. Relay Boards: **[One]<Insert number>** for each size and type of relay board installed.
5. Operator Interface: **[One]<Insert number>** microprocessor board(s), complete with display and membrane keypad.
6. **<Insert extra materials>**.

1.7 WARRANTY

- A. Manufacturer Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace fire pumps and controllers that fail in materials or workmanship within specified warranty period.
- B. Special Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace components of fire pumps and controllers, including **[auxiliary contacts for magnetic contactors][power contacts for magnetic contactors][contactor coils for magnetic contactors][relay boards][operator interface microprocessor boards]<Insert components>** that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire pumps are to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**, **[NFPA 13]**, **[NFPA 14]**, and NFPA 20. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria" for building seismic performance criteria.
 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified **[and the unit will be fully operational after the seismic event]**."
 2. Component Importance Factor: 1.5.
 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 FIRE PUMPS - ELECTRIC DRIVE

- A. Fire Pump - Electric Drive, End Suction:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Aurora; a Pentair brand]**
 - d. **[Fairbanks Nijhuis; a Pentair brand]**



- e. [Patterson Pump Company; a Gorman-Rupp company]
 - f. [Peerless Pump Company]
 - g. [Reddy-Buffaloes Pump Company]
 - h. [Ruhrpumpen, Inc]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [A C Fire Pump; a Xylem brand]
 - b. [Armstrong Fluid Technology]
 - c. [Aurora; a Pentair brand]
 - d. [Fairbanks Nijhuis; a Pentair brand]
 - e. [Patterson Pump Company; a Gorman-Rupp company]
 - f. [Peerless Pump Company]
 - g. [Reddy-Buffaloes Pump Company]
 - h. [Ruhrpumpen, Inc]
 - i. <Insert manufacturer's name>
3. Source Limitations:
- a. Obtain fire pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description: Factory-assembled and -tested fire-pump and electric drive.
- a. Pump Equipment, Accessory, and Specialty Pressure Rating: [**175 psig (1200 kPa)**]<Insert minimum pressure> minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
5. Standards:
- a. Comply with NFPA 20.
 - b. <Insert standard>.
6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
- a. Standard: [**UL 448**]<Insert standard>, for end-suction pumps for fire service.
 - b. Casing: Top centerline discharge, self-venting, cast iron, with ASME B16.1 pipe-flange connections.
 - c. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Steel shaft with [**bronze**][**stainless steel**] sleeves.
 - 1) Shaft Bearings: Grease-lubricated, back-to-back thrust ball bearings and one radial roller bearing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Back pullout design, allowing complete rotating assembly removal without disturbing the casing piping connections. Horizontal pump and driver shafts with pump and

driver on same base.

8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling/shaft guard.
9. Driver:
 - a. Type: Electric motor; NEMA MG 1, **[polyphase Design B][inverter-duty, for variable-speed controller]**.
 - b. Standard: **[UL 1004-1][UL 1004-5]<Insert standard>**.
10. Controller Type: **[Full service][Variable speed]**.
11. Capacities and Characteristics:
 - a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Rated Head: **<Insert feet or psig (kPa)>**.
 - c. Inlet Flange: **[Class 125][Class 250]<Insert class>**.
 - d. Outlet Flange: **[Class 125][Class 250]<Insert class>**.
 - e. Suction Head Available at Pump: **<Insert feet (m)>**.
 - f. Motor Horsepower: **<Insert number> hp**.
 - g. Motor Speed: **<Insert number> rpm**.
 - h. Electrical Characteristics:
 - 1) Volts: **[208][230][460]<Insert number> V**.
 - 2) Phase: Three.
 - 3) Hertz: 60.
 - 4) Full-Load Amperes: **<Insert number> A**.
 - 5) Minimum Circuit Ampacity: **<Insert number> A**.
 - 6) Maximum Overcurrent Protection: **<Insert number> A**.
 - i. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
 - j. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.
12. Source Quality Control:
 - a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.

B. Fire Pump - Electric Drive, In Line:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Aurora; a Pentair brand]**
 - d. **[Fairbanks Nijhuis; a Pentair brand]**
 - e. **[Patterson Pump Company; a Gorman-Rupp company]**
 - f. **[Peerless Pump Company]**
 - g. **[Plad Equipment, Ltd.]**
 - h. **[Reddy-Buffaloes Pump Company]**



- i. [Ruhrpumpen, Inc]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A C Fire Pump; a Xylem brand]
 - b. [Armstrong Fluid Technology]
 - c. [Aurora; a Pentair brand]
 - d. [Fairbanks Nijhuis; a Pentair brand]
 - e. [Patterson Pump Company; a Gorman-Rupp company]
 - f. [Peerless Pump Company]
 - g. [Plad Equipment, Ltd.]
 - h. [Reddy-Buffaloes Pump Company]
 - i. [Ruhrpumpen, Inc]
 - j. <Insert manufacturer's name>
3. Source Limitations:
 - a. Obtain fire pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description: Factory-assembled and -tested fire-pump and electric drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: [175 psig (1200 kPa)]<Insert minimum pressure> minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
5. Standards:
 - a. Comply with NFPA 20.
 - b. <Insert standard>.
6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
 - a. Standard: [UL 448]<Insert standard>, for in-line pumps for fire service.
 - b. Casing: Cast iron, with ASME B16.1 pipe-flange connections.
 - c. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Vertical pump and driver shaft with motor above pump and pump on mounting foot. Motor and pump rotating assembly are to be removable from top without removing the pump casing from the piping.
8. Coupling: None or rigid.
9. Driver:

- a. Standard: [UL 1004-1][UL 1004-5]<Insert standard>.
 - b. Type: Electric motor; NEMA MG 1, [polyphase Design B][inverter-duty, for variable-speed controller].
10. Controller Type: [Full service][Variable speed].
11. Capacities and Characteristics:
 - a. Rated Capacity: <Insert gpm (L/minute)>.
 - b. Total Rated Head: <Insert feet or psig (kPa)>.
 - c. Inlet Flange: [Class 125][Class 250]<Insert class>.
 - d. Outlet Flange: [Class 125][Class 250]<Insert class>.
 - e. Suction Head Available at Pump: <Insert feet (m)>.
 - f. Motor Horsepower: <Insert number> hp.
 - g. Motor Speed: <Insert number> rpm.
 - h. Electrical Characteristics:
 - 1) Volts: [208][230][460]<Insert number> V.
 - 2) Phase: Three.
 - 3) Hertz: 60.
 - 4) Full-Load Amperes: <Insert number> A.
 - 5) Minimum Circuit Ampacity: <Insert number> A.
 - 6) Maximum Overcurrent Protection: <Insert number> A.
 - i. Pump-Start, Pressure-Switch Setting: <Insert psig (kPa)>.
 - j. Pump-Stop, Pressure-Switch Setting: <Insert psig (kPa)>.
12. Source Quality Control:
 - a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.
- C. Fire Pump - Electric Drive, Split Case, Horizontally Mounted, Single Stage:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A C Fire Pump; a Xylem brand]
 - b. [Armstrong Fluid Technology]
 - c. [Aurora; a Pentair brand]
 - d. [Fairbanks Nijhuis; a Pentair brand]
 - e. [Patterson Pump Company; a Gorman-Rupp company]
 - f. [Peerless Pump Company]
 - g. [Plad Equipment, Ltd.]
 - h. [Reddy-Bufferloes Pump Company]
 - i. [Ruhrpumpen, Inc]
 - j. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [A C Fire Pump; a Xylem brand]
 - b. [Armstrong Fluid Technology]
 - c. [Aurora; a Pentair brand]
 - d. [Fairbanks Nijhuis; a Pentair brand]
 - e. [Patterson Pump Company; a Gorman-Rupp company]
 - f. [Peerless Pump Company]
 - g. [Plad Equipment, Ltd.]
 - h. [Reddy-Buffaloes Pump Company]
 - i. [Ruhrpumpen, Inc]
 - j. <Insert manufacturer's name>
3. Source Limitations:
 - a. Obtain fire pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description: Factory-assembled and -tested fire-pump and electric drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: **[175 psig (1200 kPa)]<Insert minimum pressure>** minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
5. Standards:
 - a. Comply with NFPA 20.
 - b. <Insert standard>.
6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
 - a. Standard: **[UL 448]<Insert standard>**, for split-case pumps for fire service.
 - b. Casing: Axially split case, cast iron, with ASME B16.1 pipe-flange connections.
 - c. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Alloy steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Horizontal pump and driver shafts with pump and driver on same base.
8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
9. Driver:
 - a. Standard: **[UL 1004-1][UL 1004-5]<Insert standard>**.
 - b. Type: Electric motor; NEMA MG 1, **[polyphase Design B][inverter-duty, for variable-speed controller]**.
10. Controller Type: **[Full service][Variable speed]**.

- a. Standard: [UL 1004-1][UL 1004-5]<Insert standard>.
 - b. Type: Electric motor; NEMA MG 1, polyphase Design B.
11. Capacities and Characteristics:
- a. Rated Capacity: <Insert gpm (L/minute)>.
 - b. Total Rated Head: <Insert feet or psig (kPa)>.
 - c. Inlet Flange: [Class 125][Class 250]<Insert class>.
 - d. Outlet Flange: [Class 125][Class 250]<Insert class>.
 - e. Suction Head Available at Pump: <Insert feet (m)>.
 - f. Motor Horsepower: <Insert number> hp.
 - g. Motor Speed: <Insert number> rpm.
 - h. Electrical Characteristics:
 - 1) Volts: [208][230][460]<Insert number> V.
 - 2) Phase: Three.
 - 3) Hertz: 60.
 - 4) Full-Load Amperes: <Insert number> A.
 - 5) Minimum Circuit Ampacity: <Insert number> A.
 - 6) Maximum Overcurrent Protection: <Insert number> A.
 - i. Pump-Start, Pressure-Switch Setting: <Insert psig (kPa)>.
 - j. Pump-Stop, Pressure-Switch Setting: <Insert psig (kPa)>.
 - k. Rotation [Clockwise][Counterclockwise].
12. Source Quality Control:
- a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.
- D. Fire Pump - Electric Drive, Split Case, Horizontally Mounted, Two Stage:
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A C Fire Pump; a Xylem brand]
 - b. [Fairbanks Nijhuis; a Pentair brand]
 - c. [Patterson Pump Company; a Gorman-Rupp company]
 - d. [Peerless Pump Company]
 - e. [Ruhrpumpen, Inc]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A C Fire Pump; a Xylem brand]
 - b. [Fairbanks Nijhuis; a Pentair brand]
 - c. [Patterson Pump Company; a Gorman-Rupp company]
 - d. [Peerless Pump Company]

- e. **[Ruhrpumpen, Inc]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations:
 - a. Obtain fire pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
 4. Description: Factory-assembled and -tested fire pump and electric drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: **[175 psig (1200 kPa)]<Insert minimum pressure>** minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
 5. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.
 6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
 7. Pump:
 - a. Standard: **[UL 448]<Insert standard>**, for split-case pumps for fire service.
 - b. Number of Stages: Two.
 - c. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
 - d. Impeller: Single suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
 - e. Wear Rings: Replaceable bronze.
 - f. Shaft and Sleeve: Alloy steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - g. Mounting: Horizontal pump and driver shafts with pump and driver on same base.
 8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
 9. Driver:
 - a. Type: Electric motor; NEMA MG 1, **[polyphase Design B][inverter-duty, for variable-speed controller]**.
 - b. Standard: **[UL 1004-1][UL 1004-5]<Insert standard>**.
 10. Controller Type: **[Full service][Variable speed]**.
 11. Capacities and Characteristics:
 - a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Rated Head: **<Insert feet or psig (kPa)>**.
 - c. Inlet Flange: **[Class 125][Class 250]<Insert class>**.
 - d. Outlet Flange: **[Class 125][Class 250]<Insert class>**.
 - e. Suction Head Available at Pump: **<Insert feet (m)>**.
 - f. Motor Horsepower: **<Insert number>** hp.

- g. Motor Speed: **<Insert number>** rpm.
 - h. Electrical Characteristics:
 - 1) Volts: **[208][230][460]<Insert number>** V.
 - 2) Phase: Three.
 - 3) Hertz: 60.
 - 4) Full-Load Amperes: **<Insert number>** A.
 - 5) Minimum Circuit Ampacity: **<Insert number>** A.
 - 6) Maximum Overcurrent Protection: **<Insert number>** A.
 - i. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
 - j. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.
12. Source Quality Control:
- a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.
- E. Fire Pump - Electric Drive, Split Case, Vertically Mounted, Single Stage:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aurora; a Pentair brand]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aurora; a Pentair brand]**
 - b. **<Insert manufacturer's name>**
 - 3. Source Limitations:
 - a. Obtain fire pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
 - 4. Description: Factory-assembled and -tested fire pump and electric drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: **[175 psig (1200 kPa)]<Insert minimum pressure>** minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
 - 5. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.

6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
 - a. Standard: **[UL 448]<Insert standard>**, for split-case pumps for fire service.
 - b. Casing: Axially split case, cast iron, with ASME B16.1 pipe-flange connections.
 - c. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Alloy steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Vertical pump and driver shafts with motor above pump and pump on base.
8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
9. Driver:
 - a. Type: Electric motor; NEMA MG 1, **[polyphase Design B][inverter-duty, for variable-speed controller]**.
 - b. Standard: **[UL 1004-1][UL 1004-5]<Insert standard>**.
10. Controller Type: **[Full service][Variable speed]**.
11. Capacities and Characteristics:
 - a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Rated Head: **<Insert feet or psig (kPa)>**.
 - c. Inlet Flange: **[Class 125][Class 250]<Insert class>**.
 - d. Outlet Flange: **[Class 125][Class 250]<Insert class>**.
 - e. Suction Head Available at Pump: **<Insert feet (m)>**.
 - f. Motor Horsepower: **<Insert number>** hp.
 - g. Motor Speed: **<Insert number>** rpm.
 - h. Electrical Characteristics:
 - 1) Volts: **[208][230][460]<Insert number>** V.
 - 2) Phase: Three.
 - 3) Hertz: 60.
 - 4) Full-Load Amperes: **<Insert number>** A.
 - 5) Minimum Circuit Ampacity: **<Insert number>** A.
 - 6) Maximum Overcurrent Protection: **<Insert number>** A.
12. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
13. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.
14. Source Quality Control:
 - a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.

2.3 FIRE-PUMP CONTROLLERS - ELECTRIC DRIVE

A. Fire-Pump Controller - Electric Drive, Full Service:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations:
 - a. Obtain full-service controllers from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description:
 - a. Factory fabricated, assembled, wired, and tested; continuous-duty rated electric-drive full-service fire-pump controller.
 - b. Operation: **[Combined automatic and nonautomatic][Nonautomatic]**.
 - c. Listed as arc resistant.
 - d. Provided with arc flash mitigation.
5. Standards:
 - a. Comply with NFPA 20, including the personnel protection requirements for arc flash mitigation.
 - b. Comply with NFPA 70E.
 - c. Comply with NFPA 72.
 - d. **<Insert standard>**.
 - e. **<Insert approval>**.
 - f. IEEE Compliance: Fabricate and test enclosed controllers in accordance with IEEE 344 to withstand seismic forces defined in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
6. Listing Criteria: Investigated, labeled, and marked by UL Solutions Inc. in accordance with guide information and standards specified for the following product categories:

- a. Fire-Pump Controllers: UL CCN QYZS, including UL 508 and UL 218.
 - b. Fire-Pump Controllers Over 600 V: UL CCN QYZS, including UL 218 and UL 347.
 - c. Fire-Pump Controllers for use in Hazardous Locations: UL CCN RCYW, including UL 508 and UL 218.
7. Method of Starting:
- a. Actuation: **[Pressure][Nonpressure]**-switch actuated.
 - 1) Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - 2) Programmable minimum-run-time relay to prevent short cycling.
 - 3) Programmable timer for weekly tests.
 - b. Full-Voltage Starting: **[Across-the-line][Autotransformer][Part-winding][Primary-resistor][Primary-reactor][Wye-delta (open transition)][Wye-delta (closed transition)]<Insert type>** type magnetic controller.
 - c. Reduced-Voltage Starting: **[Reduced-voltage]<Insert type>** type solid-state controller.
 - d. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of electric or pressure actuators.
8. Method of Stopping: **[Automatic and nonautomatic shutdown after automatic starting][Nonautomatic]**.
9. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current rating equal to or greater than short-circuit current available at controller location.
10. Alternate-Source Isolating and Disconnecting Means:
- a. Integral molded-case switch, with an externally mounted operating handle.
 - b. Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker must be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
11. Enclosure:
- a. NEMA 250, Type **[2][3R][4][4X][12]<Insert type>**, IP31 **<Insert type>** minimum.
 - b. Comply with environmental conditions at installed location and NFPA 20.
 - c. Enclosure Color: **[Manufacturer's standard "fire-pump-controller red"]<Insert color>**.
 - d. Overcurrent protection device must be located in a separate enclosure or separate compartment attached to the fire-pump controller.
 - e. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.
 - f. Arc Flash Mitigation for Personnel Protection:
 - 1) Locate controllers isolating switch, with instantaneous-only overcurrent protection, in a separate enclosure or compartment attached to the controller.
 - 2) Construction of the separate enclosure or compartment must be able to totally isolate incoming normal power from the main enclosure and must be marked to prohibit energized work.
 - 3) Controllers must be listed as arc resistant.
 - g. Features:
 - 1) Floor stands, **12 inches (305 mm)** high, for floor-mounted controllers.

- 2) Space heater, [120 V(ac)][240 V(ac)][, with humidistat][, with thermostat].
- 3) Tropicalization.
- 4) <Insert feature>.

12. Door-Mounted Operator Interface and Controls:

- a. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
 - 1) Pressure and Event Recorder capable of logging pressure data and operational events with time and date stamp for the life of the controller. Data to be retrievable and downloadable to a flash memory drive via a USB port accessible to the user without having to open the controller door.
- b. Touch Screen Operator Interface:
 - 1) Provide minimum 7-inch LCD Color Touch Screen powered by an embedded microprocessor with software.
 - 2) Provide in addition to push-button operation for START/STOP/RUN TEST and graphic display of system operations, the control is to allow programming of Cut-In and Cut-Out pressures, Minimum Runtime and allow for on-screen viewing of corresponding Owner's Manual in chosen language.
- c. Local and Remote Alarm and Status Indications:
 - 1) Local Alarms are to visually indicate and differentiate by color the following:
 - a) Locked rotor current.
 - b) Fail to start.
 - c) Under current.
 - d) Over current.
 - e) Under voltage.
 - f) Over voltage.
 - g) Phase unbalance.
 - h) Check weekly test solenoid valve.
 - i) Weekly test cut-in not reached.
 - j) Transducer fault.
 - k) Control voltage not healthy.
 - l) Motor trouble.
 - m) Pump room alarm.
 - n) Invalid cut-in.
 - o) Phase reversal.
 - p) Power loss.
 - q) Phase loss L1.
 - r) Phase loss L2.
 - s) Phase loss L3.
 - t) Low water level.
 - u) Pump on demand.
 - v) Low ambient temperature.
 - w) Service required.
 - 2) Remote Alarms: Provide double pole/double throw dry contact relays for Remote Alarms for the following:
 - a) Power or phase failure and/or circuit breaker in open position.
 - b) Phase reversal.

- c) Pump run.
 - d) Common pump room alarm (field re-assignable).
 - e) Field programmable.
 - f) **<Insert remote alarm>**.
 - d. Audible alarm with Push to Silence button.
 - e. Nonautomatic START and STOP push buttons or switches.
 - f. **<Insert function>**.
13. Features:
- a. Extra Output Contacts:
 - 1) **[One]<Insert number>** NO contact(s) for motor running condition.
 - 2) **[One]<Insert number>** set(s) of contacts for loss-of-line power.
 - 3) **[One]<Insert number>** each, Form C contacts for high and low reservoir level.
 - 4) **<Insert contact type>**.
 - b. Operator Interface Communications Ports: USB, Ethernet, and TIA-485-A.
 - c. Communications Protocol Capability: Modbus with TCP/IP frame format and shielded female RJ45 connector.
 - d. **<Insert optional feature>**.
14. Automatic Transfer Switch:
- a. Complies with NFPA 20, **[UL 218]<Insert standard>**, and **[UL 1008]<Insert standard>**.
 - b. Integral with controller as a listed combination fire-pump controller and power transfer switch.
 - c. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.
 - d. Allows manual transfer from one source to the other.
 - e. Alternate-Source Isolating and Disconnecting Means:
 - 1) Integral molded-case switch, with an externally mounted operating handle.
 - 2) Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker must be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
 - f. Local and Remote Alarm and Status Indications:
 - 1) Normal source available.
 - 2) Alternate source available.
 - 3) In normal position.
 - 4) In alternate position.
 - 5) Isolating means open.
 - 6) **<Insert indication>**.
 - g. Audible alarm with Push to Silence button.
 - h. Nonautomatic (manual, nonelectric) means of transfer.
 - i. Engine test push button.
 - j. Start generator output contacts.
 - k. Timer for weekly generator tests.
 - l. **<Insert function>**.

15. Source Quality Control:

- a. Manufacturer Testing: Test and inspect fire-pump controllers in accordance with requirements in NFPA 20 and **[UL 218]<Insert standard>**.
- 1) Verification of Performance: Rate controllers in accordance with operation of functions and features specified.
- b. Prepare test and inspection reports.

B. Fire-Pump Controller - Electric Drive, Variable Speed:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Firetrol]**
 - b. **[Master Control Systems, Inc]**
 - c. **[Tornatech]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Firetrol]**
 - b. **[Master Control Systems, Inc]**
 - c. **[Tornatech]**
 - d. **<Insert manufacturer's name>**
- 3. Source Limitations:
 - a. Obtain variable-speed controllers from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
- 4. Description:
 - a. Factory fabricated, assembled, wired, and tested; continuous-duty rated electric-drive variable-speed fire-pump controller.
 - b. Operation: **[Combined automatic and nonautomatic][Nonautomatic]** .
 - c. Listed as arc resistant.
 - d. Provided with arc flash mitigation.
- 5. Standards:
 - a. Comply with NFPA 20, including the personnel protection requirements for arc flash mitigation.
 - b. Comply with NFPA 70E.
 - c. Comply with NFPA 72.
 - d. **<Insert standard>**.
 - e. **<Insert approval>**.
 - f. IEEE Compliance: Fabricate and test enclosed controllers in accordance with IEEE 344 to withstand seismic forces defined in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind

Criteria" for building seismic performance criteria.

6. Listing Criteria - Investigated, labeled, and marked by UL Solutions Inc. in accordance with guide information and standards specified for the following product categories:
 - a. Fire-Pump Controllers: UL CCN QYZS, including UL 508 and UL 218.
 - b. Fire-Pump Controllers Over 600 V: UL CCN QYZS, including UL 218 and UL 347.
 - c. Fire-Pump Controllers for use in Hazardous Locations: UL CCN RCYW, including UL 508 and UL 218.
7. Method of Starting:
 - a. Actuation: **[Pressure][Nonpressure]**-switch actuated.
 - 1) Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - 2) Programmable minimum-run-time relay to prevent short cycling.
 - 3) Programmable timer for weekly tests.
8. Method of Stopping: **[Automatic and nonautomatic shutdown after automatic starting][Nonautomatic]**.
9. Variable-Speed Controller:
 - a. Description: NEMA ICS 2; arranged to achieve motor variable speed by adjusting output voltage and frequency.
 - b. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
 - c. Enclosure: Unit mounted, NEMA 250, **[Type 1][Type 12]<Insert Type>**, with hinged full-front access door with lock and key.
 - d. Externally Operated Disconnect: **[Door-interlocked disconnect switch][Fused disconnect switch][Nonfused disconnect switch][Circuit breaker]** with lockable handle.
 - e. Minimum Short-Circuit Current Rating: As required by electrical power distribution system, but not less than **[42,000][65,000][100,000]<Insert value>** A.
 - f. Technology: Pulse-width-modulation (PWM) output with insulated gate bipolar transistors (IGBT); suitable for variable torque loads.
 - g. Controller is to consist of a rectifier converter section, a digital/analog driver regulator section, and an inverter output section.
 - h. Output Rating: Three phase; with voltage proportional to frequency throughout voltage range.
 - i. Output signal is to be programmed to not cause mechanical vibration issues with pump drive assembly.
 - j. Operating Requirements:
 - 1) Input AC Voltage Tolerance: **[10]<Insert number>** percent.
 - 2) Input frequency tolerance of 60 Hz, plus or minus 2 Hz.
 - 3) Capable of driving full motor load, without derating.
 - 4) Minimum Efficiency: **[96 percent]<Insert efficiency>** at 60 Hz, full load.
 - 5) Minimum Displacement Primary-Side Power Factor: **[95 percent]<Insert value>**.
 - 6) Overload Capability: **[1.05]<Insert value>** times the full-load current for 7 seconds.
 - 7) Starting Torque: As required by pump and motor drive assembly.
 - 8) Speed Regulation: **[1]<Insert number>** percent.
 - 9) Speed Range: **[10:1]<Insert range>** speed range.
 - 10) To avoid equipment resonant vibrations, include critical speed lockout circuitry to allow bands of operating frequency at which controller will not operate continuously.

- 11) Capable of being restarted into a motor coasting in either the forward or reverse direction without tripping.
- k. Controller Adjustability Capabilities: Minimum and maximum output frequency, acceleration and deceleration, and current limit.
- l. Self-Protection and Reliability Features: Subjecting the controller to any of the following conditions is not to result in component failure or need for replacement:
 - 1) Surge suppression.
 - 2) Loss of input signal protection.
 - 3) Critical frequency rejection.
 - 4) Overtemperature.
 - 5) Short circuit at controller output.
 - 6) Ground fault at controller output. Variable-frequency controller is to be able to start a grounded motor.
 - 7) Open circuit at controller output.
 - 8) Input undervoltage.
 - 9) Input overvoltage.
 - 10) Loss of input phase.
 - 11) Reverse phase.
 - 12) AC line switching transients.
 - 13) Instantaneous overload, line to line, or line to ground.
 - 14) Sustained overload exceeding 100 percent of controller rated current.
 - 15) Starting a rotating motor.
 - 16) **<Insert features>**.
- m. Motor Protection: Controller is to protect motor against overvoltage and undervoltage, phase loss, reverse phase, overcurrent, overtemperature, and ground fault.
- n. Automatic Reset and Restart:
 - 1) Capable of multiple restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction.
 - 2) Capable of automatic restart on phase-loss and overvoltage and undervoltage trips.
- o. Visual Indication: On face of controller; indicating the following conditions:
 - 1) Power on.
 - 2) Run.
 - 3) Overcurrent and overvoltage.
 - 4) Motor speed (percentage).
 - 5) Various faults with alarm status.
 - 6) Input kilovolt amperes.
 - 7) Power factor.
 - 8) Input kilowatts and kilowatt-hours.
 - 9) Three-phase input and output voltage.
 - 10) Three-phase input and output current.
 - 11) Output frequency.
 - 12) Elapsed operating time (hours).
 - 13) Diagnostic and service parameters.
 - 14) **<Insert conditions>**.
- p. Operator Interface: Start-stop and auto-manual selector with manual-speed-control potentiometer.
- q. Hardwired Control Signal Interface: A minimum of [two]<Insert number> analog inputs (0 to 10 V or 0/4 to 20 mA) and [four]<Insert number> programmable digital inputs.
- r. Remote Communication Interface: [ASHRAE 135 BACnet MS/TP][ASHRAE 135 BACnet

- s. **IP]<Insert requirements>.**
Line Conditioning:
 - 1) Input line conditioning.
 - 2) Output filtering.
 - 3) EMI/RFI filtering.
- t. Bypass Controller:
 - 1) Bypass Controller/Variable-Frequency Controller Selector Switch: Include manual selector switch on face of enclosure for local operator control of preferred controller.
 - 2) Bypass Mode: **[Field-selectable automatic]<Insert mode>.**
 - a) In automatic mode, include fail-safe control logic to automatically transfer pump motor operation from failed variable-frequency controller to bypass controller.
 - 3) Type: Integrated NEMA ICS 2, Class A, full-voltage, non-reversing, motor-rated controller to operate pump motor if variable-frequency controller is not operational.
 - 4) Arrangement: Configure power supply to bypass controller and variable-frequency controller to completely isolate power to variable-frequency controller while operating pump motor through bypass controller for safe servicing of variable-frequency controller.
 - 5) Enclosure: Install bypass controller in same enclosure as variable-frequency controller.
 - 6) Remote Monitoring: Include control relay for remote indication of bypass controller operation.
- 10. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current rating equal to or greater than short-circuit current available at controller location.
- 11. Alternate-Source Isolating and Disconnecting Means:
 - a. Integral molded-case switch, with an externally mounted operating handle.
 - b. Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker must be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
- 12. Enclosure:
 - a. NEMA 250, Type **[2][3R][4][4X][12]<Insert type>**, IP31 **<Insert type>** minimum.
 - b. Comply with environmental conditions at installed location and NFPA 20.
 - c. Enclosure Color: **[Manufacturer's standard "fire-pump-controller red"]<Insert color>.**
 - d. Overcurrent protection device must be located in a separate enclosure or separate compartment attached to the fire-pump controller.
 - e. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.
 - f. Arc Flash Mitigation for Personnel Protection:
 - 1) Locate controllers isolating switch, with instantaneous-only overcurrent protection, in a separate enclosure or compartment attached to the controller.
 - 2) Construction of the separate enclosure or compartment must be able to totally isolate incoming normal power from the main enclosure and must be marked to prohibit energized work.
 - 3) Controllers must be listed as arc resistant.

g. Features:

- 1) Floor stands, **12 inches (305 mm)** high, for floor-mounted controllers.
- 2) Space heater, [**120 V(ac)**][**240 V(ac)**], **with humidistat**[, **with thermostat**].
- 3) Tropicalization.
- 4) **<Insert optional feature>**.

13. Door-Mounted Operator Interface and Controls:

a. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.

- 1) Pressure and Event Recorder capable of logging pressure data and operational events with time and date stamp for the life of the controller. Data to be retrievable and downloadable to a flash memory drive via a USB port accessible to the user without having to open the controller door.

b. Touch Screen Operator Interface:

- 1) Provide minimum 7-inch LCD Color Touch Screen powered by an embedded microprocessor with software.
- 2) Provide in addition to push-button operation for START/STOP/RUN TEST and graphic display of system operations, the control is to allow programming of Cut-In and Cut-Out pressures, Minimum Runtime and allow for on-screen viewing of corresponding Owner's Manual in chosen language.

c. Local Alarms and Status Indications: To visually indicate and differentiate by color the following:

- 1) Controller power on.
- 2) Motor running condition.
- 3) Loss-of-line power.
- 4) Line-power phase reversal.
- 5) Line-power single-phase condition.
- 6) Audible alarm with Push to Silence button.
- 7) Nonautomatic START and STOP push buttons or switches.
- 8) Set pressure and system pressure.
- 9) **<Insert function>**.

d. Remote Alarms and Status Indications: Provide double pole/double throw dry contacts relays for remote alarms for the following:

- 1) Power or phase failure and/or circuit breaker in open position.
- 2) Phase reversal.
- 3) Pump run.
- 4) Common pump room alarm (field re-assignable).
- 5) Field programmable. **<Insert remote alarm>**.
- 6) Audible alarm with Push to Silence button.
- 7) Nonautomatic START and STOP push buttons or switches.
- 8) Set pressure and system pressure.
- 9) **<Insert function>**.

14. Features:

a. Extra Output Contacts:

- 1) [One]<Insert number> NO contact(s) for motor running condition.
 - 2) [One]<Insert number> set(s) of contacts for loss-of-line power.
 - 3) [One]<Insert number> each, Form C contacts for high and low reservoir level.
 - 4) <Insert contact type>.
 - b. Operator Interface Communications Ports: USB, Ethernet, and TIA-485-A.
 - c. Communications Protocol Capability: Modbus with TCP/IP frame format and shielded female RJ45 connector.
 - d. <Insert optional feature>.
15. Automatic Transfer Switch:
- a. Complies with NFPA 20, [UL 218]<Insert standard>, and [UL 1008]<Insert standard>.
 - b. Integral with controller as a listed combination fire-pump controller and power transfer switch.
 - c. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.
 - d. Allows manual transfer from one source to the other.
 - e. Alternate-Source Isolating and Disconnecting Means:
 - 1) Integral molded-case switch, with an externally mounted operating handle.
 - 2) Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker must be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
 - f. Local and Remote Alarm and Status Indications:
 - 1) Normal source available.
 - 2) Alternate source available.
 - 3) In normal position.
 - 4) In alternate position.
 - 5) Isolating means open.
 - 6) <Insert indication>.
 - g. Audible alarm with Push to Silence button.
 - h. Nonautomatic (manual, nonelectric) means of transfer.
 - i. Engine test push button.
 - j. Start generator output contacts.
 - k. Timer for weekly generator tests.
 - l. <Insert function>.
16. Variable-Speed Drive Operational Modes:
- a. Operated in a proportional, integral, and derivative (PID) process control loop to control the centrifugal fire-pump speed to limit the system pressure.
 - b. PID controller receives signal from the pressure transducer that measures the system pressure.
 - c. PID output controls the current frequency of the pump motor regulating the pump speed to maintain the system pressure at the set point.
 - d. Upon detection of a drive failure, the drive is bypassed and the motor runs at full speed.
 - e. Once set point pressure is maintained for a set period, the drive soft stops the pump motor.
 - f. Provides both soft start and soft stop of the pump motor.
17. Source Quality Control:

- a. Manufacturer Testing: Test and inspect fire-pump controllers in accordance with requirements in NFPA 20 and **[UL 218]<Insert standard>**.
 - 1) Verification of Performance: Rate controllers in accordance with operation of functions and features specified.
- b. Prepare test and inspection reports.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.
- B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping.
- C. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
- D. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.
- E. Discharge Cone: **[Closed][Open][Closed or open]** type.
- F. Fire-Pump Relief Valve:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[BERMAD Control Valves]**
 - b. **[CLA-VAL]**
 - c. **[Kunkle Valve]**
 - d. **[OCV Control Valves]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BERMAD Control Valves]**
 - b. **[CLA-VAL]**
 - c. **[Kunkle Valve]**
 - d. **[OCV Control Valves]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
 - 3. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.
- G. Fire-Pump Test Connection:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[American Fire Supply]**
 - b. **[CLA-VAL]**
 - c. **[Croker; a Division of Morris Group International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[American Fire Supply]**
 - b. **[CLA-VAL]**
 - c. **[Croker; a Division of Morris Group International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
3. Standards:
- a. NFPA 20.
 - b. UL 405, except outlets without clappers instead of inlets.
4. Description: **[Flush, for wall mounting][Freestanding]<Insert type>**.
5. Pressure Rating: **175 psig (1200 kPa)** minimum.
6. Body Material: Corrosion-resistant metal with number of outlets required by NFPA 20.
7. Escutcheon Plate: Brass or bronze.
8. Hose Valves: UL 668, bronze, with outlet threaded in accordance with NFPA 1963 and matching local fire-department threads. Include caps and chains.
9. Exposed Parts Finish: **[Polished][Rough][brass][, chrome plated]**.
10. Escutcheon Plate Marking: **[FIRE-PUMP TEST CONNECTION]<Insert marking>**.

H. Fire-Pump Flowmeter Systems:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Fire Research Corp]**
 - b. **[Gerand Engineering Co]**
 - c. **[Hyspan Precision Products, Inc]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Fire Research Corp]**
 - b. **[Gerand Engineering Co]**
 - c. **[Hyspan Precision Products, Inc]**

- d. [Victaulic Company]
 - e. <Insert manufacturer's name>
- 3. Description: UL-listed or FM-Approved, fire-pump flowmeter system able to indicate flow to not less than 175 percent of fire-pump rated capacity.
 - 4. Pressure Rating: [175 psig (1200 kPa) minimum][250 psig (1725 kPa)][300 psig (2070 kPa)]<Insert pressure>.
 - 5. Sensor: [Venturi][Paddlewheel]<Insert type>. Sensor size is to match pipe, tubing, flowmeter, and fittings.
 - 6. Permanently Mounted Flowmeter: Compatible with flow sensor; with dial not less than 4-1/2 inches (115 mm) in diameter.[Include bracket or device for remote mounting.]
 - a. Tubing Package: NPS 1/8 or NPS 1/4 (DN 6 or DN 10) plastic tubing with copper or brass fittings and valves.
 - 7. Portable Flowmeter: Compatible with flow sensor; with dial not less than 4-1/2 inches (115 mm) in diameter and with two 12-foot- (3.7-m-) long hoses in carrying case.

2.5 FIRE-PUMP CONTROLLER REMOTE ALARM PANELS

A. Fire-Pump Controller Remote Alarm Panel:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Eaton]
 - b. [Firetrol]
 - c. [Master Control Systems, Inc]
 - d. [Metron Eledyne; a Hubbell Company]
 - e. [Tornatech]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Eaton]
 - b. [Firetrol]
 - c. [Master Control Systems, Inc]
 - d. [Metron Eledyne; a Hubbell Company]
 - e. [Tornatech]
 - f. <Insert manufacturer's name>
- 3. Source Limitations: Obtain remote alarm panels from single manufacturer.
- 4. Standards:
 - a. Comply with NFPA 20.
 - b. <Insert standard>.
- 5. Description:
 - a. Factory fabricated, assembled, wired, and tested.

6. Supervisory and Normal Control Voltage: **[120 V(ac)][208 V(ac)]<Insert voltage>; [single][dual]** source.
7. Audible and Visual Alarm and Status Indications for Electric-Driven Pump Controllers:
 - a. Driver running.
 - b. Loss of phase.
 - c. Phase reversal.
 - d. Supervised power on.
 - e. Trouble Alarm: **[Common][Separate]** trouble on the controller.
 - 1) **<Insert alarm>**.
 - f. Controller connected to alternate power source.
 - g. **<Insert indication>**.
8. Audible alarm, with silence push button.
9. Pump REMOTE START push button.

2.6 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink and recommended for interior and exterior applications.
- C. Design Mix: **5000 psi (34 MPa)**, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, surfaces to receive equipment, equipment bases and anchorage provisions, with installing contractor(s)[, **Architect**][, **Engineer**][, **Construction Manager**], and Manufacturer's Representative present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the fire pump and fire-pump controller.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.
- C. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION OF FIRE-PUMP CONTROLLERS

- A. Temporary Heating: Apply temporary heat to maintain temperature in accordance with manufacturer's written instructions until enclosed fire-pump controllers are ready to be energized and placed into service.

- B. Replace fire-pump controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.3 INSTALLATION OF FIRE PUMPS - ELECTRIC DRIVE

- A. Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting:
 - 1. Install fire pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
 - 3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
- C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.
- D. Support piping and pumps separately, so weight of piping does not rest on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211000 "Water-Based Fire-Suppression Systems."
- F. Install pressure gauges on fire-pump suction and discharge flange pressure-gauge tapings. Comply with requirements for pressure gauges specified in Section 211000 "Water-Based Fire-Suppression Systems."
- G. Install piping hangers and supports, anchors, valves, gauges, and equipment supports in accordance with NFPA 20, **[NFPA 13],[and][NFPA 14]<Insert standard>**.
- H. Install flowmeters and sensors. Install flowmeter-system components and make connections in accordance with NFPA 20 and manufacturer's written instructions.
- I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 ALIGNMENT OF FIRE PUMPS

- A. Align **[end-suction][and][split-case]** pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment in accordance with HI 1.4 and to tolerances specified by manufacturer.

3.5 PIPING CONNECTIONS

- A. Comply with requirements for piping and valves specified in Section 211000 "Water-Based Fire-Suppression Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect relief-valve discharge to drainage piping or point of discharge.
- D. Connect flowmeter-system meters, sensors, and valves to tubing.
- E. Connect fire pumps to their controllers.

3.6 INSTALLATION OF FIRE-PUMP CONTROLLERS - ELECTRIC DRIVE

- A. Coordinate installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Install controllers within sight of their respective drivers.
- D. Connect controllers to their dedicated pressure-sensing lines.
- E. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than **79 inches (2 m)** above finished floor, and bottom of enclosure not less than **12 inches (305 mm)** above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- F. Floor-Mounting Controllers: Install controllers on concrete base(s), using floor stands high enough so that the bottom of enclosure cabinet is not less than **12 inches (305 mm)** above finished floor. Comply with requirements for concrete bases specified in Section 260529 "Hangers and Supports for Electrical Systems."
 - 1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 - 2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Seismic Bracing: Comply with requirements specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
- H. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- I. Comply with NEMA ICS 15.
- J. Installation of Power Wiring.

1. Install power wiring between fire-pump controllers and their services or sources, and between fire-pump controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70 (including Article 695 "Fire Pumps"), and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

K. Installation of Control and Alarm Wiring:

1. Install wiring between fire-pump controllers and remote devices[**and facility's central monitoring system**]. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."
2. Install wiring between remote alarm panels and fire-pump controllers. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."
3. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 284600 "Fire Detection and Alarm."
4. Bundle, train, and support wiring in enclosures.
5. Connect remote manual and automatic activation devices where applicable.

L. Field Acceptance Testing and Inspection:

1. Acceptance Testing Preparation:
 - a. Inspect and Test Each Component:
 - 1) Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
 - 2) Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
 - 3) Test continuity of each circuit.
 - b. Verify and Test Each Electric-Drive Controller:
 - 1) Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for motor, notify **[Architect][Construction Manager][Owner]** before starting the motor(s).
 - 2) Test each motor for proper phase rotation.
 - 3) Verify short-circuit current rating.
 - c. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - d. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Representatives from manufacturers of fire-pump controllers must be present during acceptance tests and inspections in accordance with NFPA 20.
3. Acceptance tests and inspections must be witnessed by **[Architect][Construction Manager][Owner][authorities having jurisdiction]<Insert names or titles of witnesses>**.
4. Acceptance Tests and Inspections:
 - a. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to **[Architect][Construction Manager][Owner]** and authorities having jurisdiction.
 - b. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
 - c. Engage manufacturer's factory-authorized service representative to be present during the

- testing.
- d. Perform field acceptance tests as outlined in NFPA 20.

5. Nonconforming Work:

- a. Controllers will be considered defective if they do not pass tests and inspections.
- b. Remove and replace defective units with new units and retest.

6. Prepare and submit field acceptance testing and inspection reports.

3.7 INSTALLATION OF FIRE-PUMP CONTROLLER REMOTE ALARM PANELS

- A. Install panels on walls with tops not higher than **[72 inches (1829 mm)]<Insert height>** above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For panels not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

3.8 IDENTIFICATION OF FIRE PUMPS AND FIRE-PUMP CONTROLLERS

- A. Comply with NFPA 20 requirements for marking of fire pumps and fire-pump controllers.
- B. Field label controllers for arc flash risk in accordance with NFPA 70E.
- C. Permanently mark fire-pump controller enclosure and overcurrent protective device enclosure to prohibit energized work in accordance with NFPA requirements.
- D. Identify equipment, system components, piping, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment and Section 260553 "Identification for Electrical Systems."

3.9 STARTUP SERVICE FOR FIRE PUMPS AND CONTROLLERS

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. **<Insert startup steps>**.

3.10 ADJUSTING

- A. Adjust fire-pump controllers to function smoothly and as recommended by manufacturer.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.
- C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- D. Set field-adjustable pressure switches.

3.11 FIELD QUALITY CONTROL

- A. Test each fire pump with its controller as a unit.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**].
 - 1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
 - 2. Test in accordance with NFPA 20 for acceptance and performance testing.
 - a. Prior to initial startup and acceptance testing, complete and check all electric wiring serving fire-pump motor, pressure-maintenance pump motor, and fire-pump controller, including control interwiring, normal power, and alternate power.
 - b. Perform arc flash risk assessment for all electric fire-pump controllers in accordance with NFPA 70E or other code required by the authorities having jurisdiction.
 - c. Field label electric fire-pump controllers for arc flash risk in accordance with NFPA 70E or other code required by the authorities having jurisdiction.
 - 3. Leak Test: After installation, fill system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.12 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain fire pump and associated controller.

END OF SECTION 21 31 13 00



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21 - Fire Suppression

Task	Specification	Specification Description
21 31 13 00	01 91 13 00a	Commissioning Of Fire Suppression
21 31 13 00	21 34 13 00	Pressure-Maintenance Pumps



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SECTION 21 31 16 00 - DIESEL-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire pumps - diesel drive, centrifugal.
2. Diesel engine driver.
3. Fire-pump controller - for diesel-drive fire pumps.
4. Fire-pump accessories and specialties.
5. Fire-pump controller remote alarm panel.
6. Fuel oil storage.
7. Grout.

B. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on Project.
2. Section 260010 "Supplemental Requirements for Electrical" specifies requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.

1.2 DEFINITIONS

- A. ECM:** Electronic control module.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire pump and fire-pump controller.
2. Include rated capacities, operating characteristics, factory-certified performance test curves, electrical characteristics, and furnished accessories and specialties.

B. Shop Drawings: For packaged fire pump and diesel driver, fire-pump controller, and fire-pump accessories and specialties.

1. Provide fabrication and installation details including plans, elevations, sections, and mounting and attachment details.
2. Provide details of equipment assemblies. Indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Provide wiring diagrams for power, signal, and control wiring.
5. For fire-pump controllers, show the following:



- a. Each installed unit's type and details.
- b. Enclosure types and details for types other than NEMA 250, Type 2.
- c. Factory-installed devices.
- d. Nameplate legends.
- e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
- f. Specified modifications.

C. Delegated Design Submittals: For fire pump and fire-pump controller.

1. Include design calculations for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For fire pumps, controllers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of fire pump and fire-pump controller, from manufacturer.

C. Source quality control reports.

D. Field acceptance testing and inspection reports for fire-pump controllers.

E. Field quality control reports.

F. Certified shop test curves showing head capacity and brake horsepower for each pump.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire pumps and fire-pump controllers to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match fire-pump controllers installed and that are packaged with protective coverings for storage and identified with labels describing contents.

1. Auxiliary Contacts: **[One]<Insert number>** for each size and type of magnetic contactor installed.
2. Power Contacts: **[Three]<Insert number>** for each size and type of magnetic contactor installed.
3. Contactor Coils: **[One]<Insert number>** for each size and type of magnetic controller installed.
4. Relay Boards: **[One]<Insert number>** for each size and type of relay board installed.
5. Operator Interface: **[One]<Insert number>** microprocessor board(s), complete with display and membrane keypad.

6. <Insert extra materials>.

1.7 WARRANTY

- A. Manufacturer Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace fire pumps and controllers that fail in materials or workmanship within specified warranty period.
- B. Special Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace components of fire pumps and controllers, including **[auxiliary contacts for magnetic contactors][power contacts for magnetic contactors][contactor coils for magnetic contactors][relay boards][operator interface microprocessor boards]**<Insert components> that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire pumps are to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>[, NFPA 13][, NFPA 14]**, and NFPA 20. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria" for building seismic performance criteria.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified**[and the unit will be fully operational after the seismic event].**"
 - 2. Component Importance Factor: 1.5.
 - 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>.**
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 FIRE PUMPS - DIESEL DRIVE, CENTRIFUGAL

- A. Fire Pump - Diesel Drive, End Suction Centrifugal:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Pentair Aurora; Pentair Pump Group]**
 - e. **[Reddy-Buffaloes Pump Company]**
 - f. **[Ruhrpumpen, Inc]**
 - g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Pentair Aurora; Pentair Pump Group]**
 - e. **[Reddy-Buffaloes Pump Company]**
 - f. **[Ruhrpumpen, Inc]**
 - g. **<Insert manufacturer's name>**
3. Source Limitations:
 - a. Obtain fire pump and diesel drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description: Factory-fabricated, -assembled, and -tested fire pump and diesel drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: **[175 psig (1200 kPa)]<Insert minimum pressure>** minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
5. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.
6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
 - a. Standard: **[UL 448]<Insert standard>**, for end-suction pumps for fire service.
 - b. Casing: Top centerline discharge self-venting cast iron with ASME B16.1 pipe-flange connections.
 - c. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Steel shaft with **[bronze][stainless steel]** sleeves.
 - 1) Shaft Bearings: Grease-lubricated, back-to-back thrust ball bearings and one radial roller bearing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Back pullout design allowing complete rotating assembly removal without disturbing the casing piping connections. Pump and driver shafts are horizontal, with pump and driver on same base.
8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
9. Driver: Diesel engine.
10. Controller: Diesel engine drive.
11. Capacities and Characteristics:

- a. Rated Capacity: **<Insert gpm (L/minute)>**.
- b. Total Rated Head: **<Insert feet or psig (kPa)>**.
- c. Inlet Flange: **[Class 125][Class 250]<Insert class>**.
- d. Outlet Flange: **[Class 125][Class 250]<Insert class>**.
- e. Suction Head Available at Pump: **<Insert feet (m)>**.
- f. Engine Horsepower: **<Insert number>** hp.
- g. Engine Speed: **<Insert number>** rpm.
- h. Fuel Tank Capacity: **<Insert gal. (L)>**.
- i. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
- j. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.

12. Source Quality Control:

- a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
- b. Prepare test and inspection reports.

B. Fire Pump - Diesel Drive, Split Case, Horizontally Mounted, Single Stage, Centrifugal:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Peerless Pump Company]**
 - e. **[Pentair Aurora; Pentair Pump Group]**
 - f. **[Plad Equipment, Ltd.]**
 - g. **[Reddy-Buffaloes Pump Company]**
 - h. **[Ruhrpumpen, Inc]**
 - i. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Peerless Pump Company]**
 - e. **[Pentair Aurora; Pentair Pump Group]**
 - f. **[Plad Equipment, Ltd.]**
 - g. **[Reddy-Buffaloes Pump Company]**
 - h. **[Ruhrpumpen, Inc]**
 - i. **<Insert manufacturer's name>**
- 3. Source Limitations:
 - a. Obtain fire pump and diesel drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.



4. Description: Factory-fabricated, -assembled, and -tested fire-pump and diesel drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: [175 psig (1200 kPa)]<Insert minimum pressure> minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
5. Standards:
 - a. Comply with NFPA 20.
 - b. <Insert standard>.
6. Base: Fabricated and attached to fire pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
7. Pump:
 - a. Standard: [UL 448]<Insert standard>, for split-case pumps for fire service.
 - b. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
 - c. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
 - d. Wear Rings: Replaceable bronze.
 - e. Shaft and Sleeve: Alloy-steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - f. Mounting: Horizontal pump and driver shafts with pump and driver on same base.
8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
9. Driver: Diesel engine.
10. Controller: Diesel engine drive.
11. Capacities and Characteristics:
 - a. Rated Capacity: <Insert gpm (L/minute)>.
 - b. Total Rated Head: <Insert feet or psig (kPa)>.
 - c. Inlet Flange: [Class 125][Class 250]<Insert class>.
 - d. Outlet Flange: [Class 125][Class 250]<Insert class>.
 - e. Suction Head Available at Pump: <Insert feet (m)>.
 - f. Engine Horsepower: <Insert number> hp.
 - g. Engine Speed: <Insert number> rpm.
 - h. Fuel Tank Capacity: <Insert gal. (L)>.
 - i. Pump-Start, Pressure-Switch Setting: <Insert psig (kPa)>.
 - j. Pump-Stop, Pressure-Switch Setting: <Insert psig (kPa)>.
 - k. Rotation [Clockwise][Counterclockwise].
12. Source Quality Control:
 - a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.

- C. Fire Pump - Diesel Drive, Split Case, Horizontally Mounted, Two Stage, Centrifugal:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Patterson Pump Company; a Gorman-Rupp company]**
 - c. **[Peerless Pump Company]**
 - d. **[Pentair Aurora; Pentair Pump Group]**
 - e. **[Ruhrpumpen, Inc]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Patterson Pump Company; a Gorman-Rupp company]**
 - c. **[Peerless Pump Company]**
 - d. **[Pentair Aurora; Pentair Pump Group]**
 - e. **[Ruhrpumpen, Inc]**
 - f. **<Insert manufacturer's name>**
 3. Source Limitations:
 - a. Obtain fire pump and diesel driver from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
 4. Description: Factory-fabricated, -assembled, and -tested fire pump and diesel drive.
 - a. Pump Equipment, Accessory, and Specialty Pressure Rating: **[175 psig (1200 kPa)]<Insert minimum pressure>** minimum.
 - b. Finish: Red paint applied to factory-assembled and -tested unit before shipping.
 5. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.
 6. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
 7. Pump:
 - a. Standard: **[UL 448]<Insert standard>**, for split-case pumps for fire service.
 - b. Number Stages: Two.
 - c. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
 - d. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
 - e. Wear Rings: Replaceable bronze.
 - f. Shaft and Sleeve: Alloy-steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn

and bronze packing gland.

- g. Mounting: Horizontal pump and driver shafts with pump and driver on same base.
- 8. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
- 9. Driver: Diesel engine.
- 10. Controller: Diesel engine drive.
- 11. Capacities and Characteristics:
 - a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Rated Head: **<Insert feet or psig (kPa)>**.
 - c. Inlet Flange: **[Class 125][Class 250]<Insert class>**.
 - d. Outlet Flange: **[Class 125][Class 250]<Insert class>**.
 - e. Suction Head Available at Pump: **<Insert feet (m)>**.
 - f. Engine Horsepower: **<Insert number>** hp.
 - g. Engine Speed: **<Insert number>** rpm.
 - h. Fuel Tank Capacity: **<Insert gal. (L)>**.
 - i. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
 - j. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.
- 12. Source Quality Control:
 - a. Manufacturer Testing: Test and inspect fire pumps in accordance with UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1) Verification of Performance: Rate fire pumps in accordance with UL 448.
 - b. Prepare test and inspection reports.

2.3 DIESEL ENGINE DRIVER

A. Diesel Engine Driver:

- 1. Fuel: Fuel oil, **[Grade DF-2]<Insert grade>**.
- 2. Horsepower Rating: Not less than 110 percent of maximum brake horsepower (after derating for temperature and elevation in accordance with NFPA 20).
- 3. Emergency Manual Operator: Factory wired for starting and operating standby engine in case of malfunction in main controller or wiring.
- 4. Controls:
 - a. Adjustable governor.
 - b. Over-speed shutdown.
 - c. Manual reset, speed switch.
 - d. Instrument panel with tachometer, oil pressure gauge, water temperature gauge, and hour meter.
- 5. Fuel System:
 - a. Comply with NFPA 20.
 - b. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
 - c. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

- d. Flexible metallic fuel lines.
 - e. Inline fuel filter.
 - f. Oil pressure safety switch.
 - g. Air cleaner.
 - h. Engine-driven oil pump.
 - i. Enclosed control wiring electric starter with voltage regulator.
 - j. Storage Tank: [**Double wall**,] size indicated, but not less than required by NFPA 20; with floor legs, direct-reading level gauge[, and **secondary containment tank having capacity at least equal to storage tank**].
6. Exhaust System:
- a. Piping: ASTM A53/A53M, Type E or S, Schedule 40 black steel pipe; ASME B16.9 weld-type pipe fittings; ASME B16.5 steel flanges; and ASME B16.21 nonmetallic gaskets.
 - b. Fabricate double-wall, ventilated thimble from steel pipe.
 - c. Flexible exhaust connector.
 - d. [**Industrial**]-[**Residential**]-[**Critical**]-[**Super Critical**]-[**Hospital**]-[**Hospital Plus**]-[**Extreme**]-grade exhaust silencer with spark arrestor.
7. Rated Engine Speed: 1800 rpm.
8. Maximum Piston Speed for Four-Cycle Engines: **2250 fpm (11.4 m/s)**.
9. Engine- or Skid-Mounted Lubrication System:
- a. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 - b. Thermostatic Control Valve: Controls flow in system to maintain optimum oil temperature. Unit is to be capable of full flow and is designed to be fail-safe.
 - c. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
10. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system.
11. Cooling System, Factory-Mounted Radiator:
- a. Factory installed, closed loop, liquid cooled, with radiator factory mounted on fire-pump mounting frame and integral engine-driven coolant pump.
 - b. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - c. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - d. Expansion Tank: Constructed of welded-steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gauge glass and petcock.
 - e. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 - f. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
- 1) Rating: **50 psig (345 kPa)** maximum working pressure, with coolant at **180 deg F (82 deg C)**, and noncollapsible under vacuum.
 - 2) End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
12. Cooling System, Remote Radiator:
- a. Closed loop, liquid cooled, with remote radiator and integral engine-driven coolant pump.
 - b. Configuration: [**Vertical**]-[**Horizontal**] air discharge.

- c. Radiator Core Tubes: **[Aluminum][Nonferrous-metal construction other than aluminum]**.
 - d. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - e. Expansion Tank: Constructed of welded-steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gauge glass and petcock.
 - f. Fan: Driven by **[multiple belts from engine shaft][totally enclosed electric motor with sealed bearings]**.
 - g. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - h. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
13. Muffler/Silencer, Industrial Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of **[15 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[25 ft. (8 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
 14. Muffler/Silencer, Residential Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of **[20 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
 15. Muffler/Silencer, Critical Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of **[25 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
 16. Muffler/Silencer, Super Critical Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of **[30 dBA]<Insert dbA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
 17. Muffler/Silencer, Hospital Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of **[35 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
 18. Muffler/Silencer, Hospital Plus Grade: Sized as recommended by engine manufacturer and

selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

- a. Minimum sound attenuation of **[35 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
19. Muffler/Silencer, Extreme Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
- a. Minimum sound attenuation of **[40 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
20. Muffler/Silencer, Super Extreme Grade: Sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
- a. Minimum sound attenuation of **[45 dBA]<Insert dBA>** at 500 Hz.
 - b. Sound level measured at a distance of **[10 ft. (3 m)]<Insert distance>** from exhaust discharge after installation is complete is to be **[85]<Insert number>** dBA or less.
21. Air-Intake Filter: **[Standard][Heavy]**-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
22. Starting System: **[12][24]**-V dc, with negative ground.
- a. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
 - b. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - c. Cranking Cycle: **[60]<Insert number>** seconds.
 - d. Battery: Adequate capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least **[twice][three times]** without recharging.
 - e. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 - f. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater is to be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place.
 - g. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
 - h. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit is to comply with UL 1236 and include the following features:
 - 1) Operation: Equalizing-charging rate of 10 A is to be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit is then to be automatically switched to a lower float-charging mode and is to continue to operate in that mode until battery is discharged again.
 - 2) Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - 3) Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.



- 4) Ammeter and Voltmeter: Flush mounted in door. Meters are to indicate charging rates.
- 5) Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition is to close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- 6) Enclosure and Mounting: NEMA 250, Type 1 wall-mounted cabinet.

2.4 FIRE-PUMP CONTROLLER - FOR DIESEL-DRIVE FIRE PUMPS

A. Fire-Pump Controllers - For Diesel-Drive Fire Pumps:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations:
 - a. Obtain diesel-drive controllers from single manufacturer.
 - b. Equipment provider is to provide services of a factory authorized service representative and have a service facility located within a **60-mile (100-km)** radius of Project site.
4. Description:
 - a. Factory fabricated, assembled, wired, and tested.
 - b. Operation: **[Combined automatic and nonautomatic][Nonautomatic]** operation.
5. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.
6. Method of Starting:

- a. Actuation: **[Pressure][Nonpressure]**-switch actuated.
 - 1) Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - 2) Programmable minimum-run-time relay to prevent short cycling.
 - 3) Programmable timer for weekly tests.
 - b. Dual, redundant dc-voltage battery units, with automatic changeover.
 - c. Emergency Control: Bypasses automatic control circuits during manual starting and running.
 - d. Automatic engine start on loss of ac power to the controller.
7. Method of Stopping: **[Automatic and nonautomatic shutdown after automatic starting][Nonautomatic]**.
8. Enclosure:
- a. NEMA 250, Type **[2][3R][4][4X][12]<Insert type>** minimum.
 - 1) Comply with environmental conditions at installed location and NFPA 20.
 - b. Enclosure Color: **[Manufacturer's standard "fire-pump-controller red"]<Insert color>**.
 - c. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.
 - d. Features:
 - 1) Floor stands, **12 inches (305 mm)** high, for floor-mounted controllers.
 - 2) Space heater, **[120 V(ac)][240 V(ac)][, with humidistat][, with thermostat]**.
 - 3) Tropicalization.
 - 4) **<Insert optional feature>**.
9. Door-Mounted Operator Interface and Controls:
- a. Monitor, display, and control devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
 - 1) Pressure and Event Recorder capable of logging pressure data and operational events with time and date stamp for the life of the controller. Data to be retrievable and downloadable to a flash memory drive via a USB port accessible to the user without having to open the controller door.
 - b. Touch Screen Operator Interface:
 - 1) Provide minimum 7-inch LCD Color Touch Screen powered by an embedded microprocessor with software.
 - 2) Provide in addition to push-button operation for START/STOP/RUN TEST and graphic display of system operations, the control is to allow programming of Cut-In and Cut-Out pressures, Minimum Runtime and is to allow for on-screen viewing of corresponding Owner's Manual in chosen language.
 - c. Local and Remote Alarm and Status Indications:
 - 1) Status LEDs - green color for the following:
 - a) Low Pressure.
 - b) Engine Run.

- c) Remote Start.
 - d) Interlock On.
 - e) Deluge Valve (if applicable).
 - f) One Programmable LED.
 - 2) Alarm LEDs - red color for the following:
 - a) Battery #1 Failure.
 - b) Charger #1 Failure.
 - c) Battery #2 Failure.
 - d) Charger #2 Failure.
 - e) Low Pressure.
 - f) System Over Pressure.
 - g) Low Suction Pressure.
 - h) Low Fuel.
 - i) Fail to Start.
 - j) High Engine Temp.
 - k) Low Oil Pressure.
 - l) Engine Over Speed.
 - m) ECM Selector in Alt Position.
 - n) Fuel Injection Malfunction.
 - o) ECM Warning.
 - p) ECM Failure.
 - q) High Raw Water Temp.
 - r) Low Engine Temperature
 - s) Fuel Spill
 - t) One Programmable LED.
 - d. Audible alarm with Push to Silence button.
 - e. Nonautomatic START and STOP push buttons or switches.
 - f. Set pressure and system pressure.
 - g. <Insert function>.
10. Features:
- a. Extra Output Contacts:
 - 1) [One]<Insert number> Form C contact(s) for low pump-room temperature.
 - 2) [One]<Insert number> each, Form C contact(s) for high and low fuel levels.
 - 3) [One]<Insert number> each, Form C contact(s) for high and low reservoir levels.
 - 4) <Insert contact type>.
 - b. Operator Interface Communications Ports: USB, Ethernet, and TIA-485-A.
 - c. Communications Protocol Capability: Modbus with TCP/IP frame format and shielded female RJ45 connector.
 - d. Powered louver contacts.
 - e. Powered engine-oil heater contacts.
 - f. <Insert optional feature>.
11. Battery Charger System:
- a. Built-in, independent, dual battery chargers with automatic changeover; [12 V(dc)][24 V(dc)] for [lead-acid][nickel-cadmium] batteries.
 - b. Standard: [UL 1236]<Insert standard>.

12. Source Quality Control:

- a. Manufacturer Testing: Test and inspect fire-pump controllers in accordance with requirements in NFPA 20 and **[UL 218]<Insert standard>**.
 - 1) Verification of Performance: Rate controllers in accordance with operation of functions and features specified.
- b. Prepare test and inspection reports.

2.5 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.
- B. Circulation Relief Valves: UL 1478, bronze or cast iron, spring loaded; for installation in pump-discharge piping.
- C. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
- D. Outlet Fitting: Concentric tapered reducer at pump-discharge outlet.
- E. Discharge Cone: **[Closed][Open][Closed or open]** type.
- F. Fire-Pump Relief Valve:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[BERMAD Control Valves]**
 - b. **[CLA-VAL]**
 - c. **[Kunkle Valve]**
 - d. **[OCV Control Valves]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BERMAD Control Valves]**
 - b. **[CLA-VAL]**
 - c. **[Kunkle Valve]**
 - d. **[OCV Control Valves]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
 - 3. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.
- G. Fire-Pump Test Connection:



1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Fire Supply]**
 - b. **[CLA-VAL]**
 - c. **[Croker; a Division of Morris Group International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Fire Supply]**
 - b. **[CLA-VAL]**
 - c. **[Croker; a Division of Morris Group International]**
 - d. **[Guardian Fire Equipment, Inc]**
 - e. **[Potter Roemer LLC; a Division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
3. Standards:
 - a. NFPA 20.
 - b. UL 405, except outlets without clappers instead of inlets.
4. Description: **[Exposed, projecting, for wall mounting][Flush, for wall mounting]<Insert type>**.
5. Pressure Rating: **175 psig (1200 kPa)** minimum.
6. Body Material: Corrosion-resistant metal with number of outlets required by NFPA 20.
7. Escutcheon Plate: Brass or bronze.
8. Hose Valves: UL 668, bronze, with outlet threaded in accordance with NFPA 1963 and matching local fire-department threads. Include caps and chains.
9. Exposed Parts Finish: **[Polished][Rough][brass][, chrome plated]**.
10. Escutcheon Plate Marking: **[FIRE-PUMP TEST CONNECTION]<Insert marking>**

H. Fire-Pump Flowmeter Systems:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Fire Research Corp]**
 - b. **[Gerand Engineering Co]**
 - c. **[Hyspan Precision Products, Inc]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Fire Research Corp]**

- b. [Gerand Engineering Co]
 - c. [Hyspan Precision Products, Inc]
 - d. [Victaulic Company]
 - e. <Insert manufacturer's name>
3. Description: UL-listed or FM-Approved, fire-pump flowmeter system with capability to indicate flow to not less than 175 percent of fire-pump rated capacity.
 4. Pressure Rating: [175 psig (1200 kPa) minimum][250 psig (1725 kPa)][300 psig (2070 kPa)]<Insert pressure>.
 5. Sensor: [Venturi][Paddlewheel]<Insert type>. Sensor size is to match pipe, tubing, flowmeter, and fittings.
 6. Permanently Mounted Flowmeter: Compatible with flow sensor, with dial not less than 4-1/2 inches (115 mm) in diameter.[Include bracket or device for wall mounting.]
 - a. Tubing Package: NPS 1/8 or NPS 1/4 (DN 6 or DN 10) plastic tubing with copper or brass fittings and valves.
 7. Portable Flowmeter: Compatible with flow sensor, with dial not less than 4-1/2 inches (115 mm) in diameter and with two 12-ft.- (3.7-m-) long hoses in carrying case.

2.6 FUEL OIL STORAGE

- A. Comply with NFPA 30.
- B. Day Tank: UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:
 1. Containment: Integral rupture basin, with a capacity of 150 percent of nominal capacity of day tank.
 - a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.
 2. Tank Capacity: [As recommended by engine manufacturer]<Insert gallons (liters)>.
 3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
 4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
 5. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.
- C. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:
 1. Tank level indicator.
 2. Capacity: Fuel for [eight]<Insert number> hours' continuous operation at 100 percent rated power output.
 3. Vandal-resistant fill cap.
 4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.7 FIRE-PUMP CONTROLLER REMOTE ALARM PANEL

- A. Fire-Pump Controller Remote Alarm Panel:



1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Eaton]**
 - b. **[Firetrol]**
 - c. **[Master Control Systems, Inc]**
 - d. **[Metron Eledyne; a Hubbell Company]**
 - e. **[Tornatech]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain remote alarm panels from single manufacturer.
4. Standards:
 - a. Comply with NFPA 20.
 - b. **<Insert standard>**.
5. Description: Factory fabricated, assembled, wired, and tested.
6. Supervisory and Normal Control Voltage: **[120 V(ac)][240 V(ac)]<Insert voltage>; [single][dual]** source.
7. Audible and Visual Alarm and Status Indications for Diesel-Driven Pump Controllers:
 - a. Normal Power On.
 - b. Supervisory Power On.
 - c. Engine Running.
 - d. Not in Auto Mode.
 - e. Low Fuel.
 - f. Common Alarm.
 - g. **<Insert alarm>**.
 - h. **<Insert alarm>** with SPDT, 8 Amp relay Output.
8. Audible alarm, with silence push button.

2.8 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink and recommended for interior and exterior applications.
- C. Design Mix: **5000 psi (34 MPa)**, 28-day compressive strength.

- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, surfaces to receive equipment, equipment bases and anchorage provisions, with installing contractor(s)[, **Architect**,][, **Engineer**,][, **Construction Manager**,] and Manufacturer's Representative present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the fire pump and fire-pump controller.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.
- C. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION OF FIRE-PUMP CONTROLLERS

- A. Temporary Heating: Apply temporary heat to maintain temperature in accordance with manufacturer's written instructions until enclosed fire-pump controllers are ready to be energized and placed into service.
- B. Replace fire-pump controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.3 INSTALLATION OF FIRE PUMPS

- A. Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting:
 - 1. Install fire pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
 - 3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
- C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.
- D. Support piping and pumps separately, so weight of piping does not rest on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211000 "Water-Based Fire-Suppression Systems."
- F. Install pressure gauges on fire-pump suction and discharge flange pressure-gauge tapings. Comply with requirements for pressure gauges specified in Section 211000 "Water-Based Fire-Suppression Systems."

- G. Install piping hangers and supports, anchors, valves, gauges, and equipment supports in accordance with NFPA 20[, **NFPA 13**,][and][**NFPA 14**<Insert standard>.
- H. Install fuel system in accordance with NFPA 20.
- I. Install water supply and drain piping for diesel-engine heat exchangers. Extend drain piping from heat exchangers to point of disposal.
- J. Install exhaust-system piping for diesel engines. Extend to point of termination outside structure. Install pipe and fittings with welded joints; install components having flanged connections with gasketed joints.
- K. Install condensate-drain piping for diesel-engine exhaust system. Extend drain piping from low points of exhaust system to condensate traps and to point of disposal.
- L. Install flowmeters and sensors. Install flowmeter-system components and make connections in accordance with NFPA 20 and manufacturer's written instructions.
- M. Electrical Wiring: Install electrical devices furnished by equipment manufacturers that are not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 ALIGNMENT OF FIRE PUMPS

- A. Align **[end-suction][and][split-case]** pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment in accordance with HI 1.4 and to tolerances specified by manufacturer.

3.5 PIPING CONNECTIONS

- A. Comply with requirements for piping and valves specified in Section 211000 "Water-Based Fire-Suppression Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect relief-valve discharge to drainage piping or point of discharge.
- D. Connect flowmeter-system meters, sensors, and valves to tubing.
- E. Connect fire pumps to their controllers.

3.6 INSTALLATION OF FIRE-PUMP CONTROLLERS

- A. Coordinate installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access

doors and panels. Ensure that controllers are within sight of fire-pump drivers.

- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Install controllers within sight of their respective drivers.
- D. Connect controllers to their dedicated pressure-sensing lines.
- E. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than **79 inches (2 m)** above finished floor, and bottom of enclosure not less than **12 inches (305 mm)** above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- F. Floor-Mounting Controllers: Install controllers on concrete base(s), using floor stands high enough so that the bottom of enclosure cabinet is not less than **12 inches (305 mm)** above finished floor. Comply with requirements for concrete bases specified in Section 260529 "Hangers and Supports for Electrical Systems."
 - 1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 - 2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Seismic Bracing: Comply with requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems" and Section 018123 "Facility Seismic and Wind Criteria."
- H. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- I. Installation of Control and Alarm Wiring:
 - 1. Install wiring between fire-pump controllers and remote devices[**and facility's central monitoring system**]. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."
 - 2. Install wiring between remote alarm panels and fire-pump controllers. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."
 - 3. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 284600 "Fire Detection and Alarm."
 - 4. Bundle, train, and support wiring in enclosures.
 - 5. Connect remote manual and automatic activation devices where applicable.
- J. Field Acceptance Testing and Inspection.
 - 1. Acceptance Testing Preparation:
 - a. Inspect and Test Each Component:
 - 1) Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
 - 2) Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
 - 3) Test continuity of each circuit.
 - 2. Representatives from manufacturers of fire-pump controllers must be present during acceptance



tests and inspections in accordance with NFPA 20.

3. Acceptance tests and inspections must be witnessed by **[Architect][Construction Manager][Owner][authorities having jurisdiction]<Insert names or titles of witnesses>**.
4. Acceptance Tests and Inspections:
 - a. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to **[Architect][Construction Manager][Owner]** and authorities having jurisdiction.
 - b. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
 - c. Engage manufacturer's factory-authorized service representative to be present during the testing.
 - d. Perform field acceptance tests as outlined in NFPA 20.
5. Nonconforming Work:
 - a. Controllers will be considered defective if they do not pass tests and inspections.
 - b. Remove and replace defective units with new units and retest.
6. Prepare and submit field acceptance testing and inspection reports.

3.7 INSTALLATION OF FIRE-PUMP CONTROLLER REMOTE ALARM PANEL

- A. Install panels on walls with tops not higher than **[72 inches (1829 mm)]<Insert height>** above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For panels not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

3.8 IDENTIFICATION OF FIRE PUMPS AND FIRE-PUMP CONTROLLERS

- A. Comply with NFPA 20 requirements for marking of fire pumps and fire-pump controllers.
- B. Identify equipment, system components, piping, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment and Section 260553 "Identification for Electrical Systems."

3.9 STARTUP SERVICE FOR FIRE PUMPS AND CONTROLLERS

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 2. **<Insert startup steps>**.

3.10 ADJUSTING

- A. Adjust fire-pump controllers and battery charger systems to function smoothly and as recommended by manufacturer.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

- C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- D. Set field-adjustable pressure switches.

3.11 FIELD QUALITY CONTROL

- A. Test each fire pump with its controller as a unit.
- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
 - 2. Test in accordance with NFPA 20 for acceptance and performance testing.
 - a. Prior to initial startup and acceptance testing, complete and check all electric wiring serving fire-pump controller and pressure-maintenance pump motor including control interwiring, normal power, and alternate power.
 - 3. Leak Test: After installation, fill system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.12 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain fire pumps, and fire-pump controllers.

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21 - Fire Suppression

Task	Specification	Specification Description
21 31 16 00	01 91 13 00a	Commissioning Of Fire Suppression
21 31 16 00	21 34 13 00	Pressure-Maintenance Pumps
21 34 00 00	01 91 13 00a	Commissioning Of Fire Suppression



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SECTION 21 34 13 00 - PRESSURE-MAINTENANCE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pressure-maintenance pumps - vertical, multistage.
2. Pressure-maintenance pumps - vertical turbine.
3. Pressure-maintenance pump controllers.
4. Grout.

B. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on Project.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on Project.
3. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" specifies seismic restraint and vibration isolation of fire suppression equipment and piping.
4. Section 260010 "Supplemental Requirements for Electrical" specifies requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.
5. Section 260573 "Power System Studies" specifies arc flash hazard analyses and arc flash hazard labeling.
6. Section 284600 "Fire Detection and Alarm" specifies supervisory connections to fire-alarm systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for pressure-maintenance pump and pressure-maintenance pump controller.
2. Include rated capacities, operating characteristics, factory-certified performance test curves, electrical characteristics, and furnished accessories and specialties.

B. Shop Drawings: For pressure-maintenance pumps, pressure-maintenance pump controllers, and pressure-maintenance pump accessories and specialties.

1. Provide fabrication and installation details, including plans, elevations, sections, and mounting and attachment details.
2. Provide details of equipment assemblies. Indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Provide wiring diagrams for power, signal, and control wiring.
5. For pressure-maintenance pump controllers, show the following:

- a. Each installed unit's type and details.
- b. Enclosure types and details for types other than NEMA, Type 2.
- c. Factory-installed devices.
- d. Nameplate legends.
- e. Short-circuit current rating of integrated unit.
- f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
- g. Specified modifications.

C. Delegated Design Submittal: For pressure-maintenance pump and pressure-maintenance pump controller.

1. Include design calculations for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For pressure-maintenance pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of pressure-maintenance pump and pressure-maintenance pump controller, from manufacturer.

C. Source quality-control reports.

D. Field-acceptance testing and inspection reports for fire-pump controllers.

E. Field quality-control reports.

F. Certified shop test curves showing head capacity and brake horsepower for each pump.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure-maintenance pumps and pressure-maintenance pump controllers to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Auxiliary Contacts: **[One]<Insert number>** for each size and type of magnetic contactor installed.
2. Power Contacts: **[Three]<Insert number>** for each size and type of magnetic contactor installed.
3. Contactor Coils: **[One]<Insert number>** for each size and type of magnetic controller installed.

4. Relay Boards: **[One]<Insert number>** for each size and type of relay board installed.
5. Operator Interface: **[One]<Insert number>** microprocessor board(s), complete with display and membrane keypad.
6. **<Insert extra materials>**.

1.6 WARRANTY

- A. Manufacturer Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace pressure-maintenance pumps and controllers that fail in materials or workmanship within specified warranty period.
- B. Special Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace components of pressure-maintenance pumps and controllers, including **[auxiliary contacts for magnetic contactors][power contacts for magnetic contactors][contactor coils for magnetic contactors][relay boards][operator interface microprocessor boards]<Insert components>** that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Pressure-maintenance pumps are to withstand the effects of earthquake motions determined in accordance with NFPA 20 **[and][ASCE/SEI 7][NFPA 13][NFPA 14]<Insert requirement>**.
 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified **[and the unit will be fully operational after the seismic event].**"
 2. Component Importance Factor: 1.5.
 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 by a qualified electrical testing agency recognized by authorities having jurisdiction and marked for intended location and application.

2.2 PRESSURE-MAINTENANCE PUMPS

- A. Pressure-Maintenance Pumps - Vertical, Multistage:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[A C Fire Pump; a Xylem brand]**
 - b. **[Armstrong Fluid Technology]**
 - c. **<Insert manufacturer's name>**
3. Source Limitations:
- a. Obtain vertical, multistage, pressure-maintenance pump and electric drive from single manufacturer.
 - b. Equipment provider is to provide services of a factory authorized service representative and have a service facility located within a **60-mile (100 km)** radius of Project site.
4. Description: Factory-fabricated, -assembled, and -tested, multistage, barrel-type vertical pressure-maintenance pump, as defined in HI 2.1-2.2 and HI 2.3; designed for surface installation with pump and motor direct coupled and mounted vertically.
5. Pump Construction:
- a. Barrel: Stainless steel.
 - b. Suction and Discharge Chamber: Cast iron with flanged inlet and outlet.
 - c. Pump Head/Motor Mount: Cast iron.
 - d. Impellers: Stainless steel, balanced, and keyed to shaft.
 - e. Pump Shaft: Stainless steel.
 - f. Seal: Mechanical type with carbon rotating face and silicon-carbide stationary seat.
 - g. Wear Rings: Teflon.
 - h. Intermediate Chamber Bearings: Aluminum-oxide ceramic or bronze.
 - i. Chamber-Base Bearing: Tungsten carbide.
 - j. O-Rings: **[EPDM][NBR][Viton]**.
6. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 210500 "Common Work Results for Fire Suppression."
- a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - b. Description: Single speed with permanently lubricated ball bearings and rigidly mounted to pump head.
7. Nameplate: Permanently attached to pump and indicating capacity and characteristics.
8. Capacities and Characteristics:
- a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Dynamic Head: **<Insert feet (kPa)>**.
 - c. Working Pressure: **[175 psig (1200 kPa) minimum][230 psig (1586 kPa)][300 psig (2070 kPa)]<Insert value>**.
 - d. Inlet and Outlet Size: **[NPS 1-1/4 (DN 32)]<Insert size>**.
 - e. Discharge and Suction Flanges: **[Class 250]<Insert class>**.
 - f. Suction Head Available at Pump: **<Insert ft. (m)>**.
 - g. Motor Horsepower: **<Insert value>**.
 - h. Motor Speed: **<Insert rpm>**.
 - i. Electrical Characteristics:
 - 1) Volts: **[120][208]<Insert value>**.
 - 2) Phases: **[Single][Three]**.
 - 3) Hertz: **[60]<Insert value>**.

- 4) Full-Load Amperes: <Insert value>.
- 5) Minimum Circuit Ampacity: <Insert value>.
- 6) Maximum Overcurrent Protection: <Insert amperage>.

- j. Pump-Start, Pressure-Switch Setting: <Insert psig (kPa)>.
- k. Pump-Stop, Pressure-Switch Setting: <Insert psig (kPa)>.

B. Pressure-Maintenance Pumps - Vertical Turbine:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Armstrong Fluid Technology]**
 - b. **[Aurora Pump; Pentair Ltd.]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Peerless Pump Company]**
 - e. **[Ruhrpumpen, Inc]**
 - f. **[Sulzer Pumps Inc.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armstrong Fluid Technology]**
 - b. **[Aurora Pump; Pentair Ltd.]**
 - c. **[Patterson Pump Company; a Gorman-Rupp company]**
 - d. **[Peerless Pump Company]**
 - e. **[Ruhrpumpen, Inc]**
 - f. **[Sulzer Pumps Inc.]**
 - g. **<Insert manufacturer's name>**
3. Source Limitations:
 - a. Obtain vertical-turbine, pressure-maintenance pump and driver from single manufacturer.
 - b. Equipment provider is to provide services of a factory-authorized service representative and have a service facility located within a **60-mile (100 km)** radius of Project site.
4. Description: Factory-fabricated, -assembled, and -tested, vertical, multistate, open-line-shaft turbine pressure-maintenance pump, as defined in HI 2.1-2.2 and HI 2.3; with pump motor mounted above pump head.
5. Pump Construction:
 - a. Pump Head: Cast iron, for surface discharge, with flange, except connections may be threaded in sizes in which flanges are not available.
 - b. Pump Head Seal: Stuffing box and stuffing.
 - c. Line Shaft and Bearings for Water-Lubricated Bearings: Static water levels of **50 ft. (15 m)** or less.
 - 1) Line Shaft: Stainless steel or steel, with corrosion-resistant shaft sleeves.
 - 2) Line Shaft Bearings: Rubber sleeve, water lubricated.
 - d. Line Shaft and Bearings for Oil-Lubricated Bearings: Static water levels between **50 and 200 ft. (15 and 61 m)**.

- 1) Line Shaft: Steel.
- 2) Line Shaft Bearings: Corrosion resistant, oil lubricated.
- e. Impeller Shaft: Monel metal or stainless steel.
- f. Bowl Section: Multiple cast-iron bowls with closed-type bronze or stainless-steel impellers.
- g. Column Pipe: ASTM A53/A53M, Schedule 40, galvanized-steel pipe with threaded ends and cast-iron or steel fittings, in sections **10 ft. (3 m)** or less, with strainer of cast or fabricated bronze or stainless steel at bottom.
6. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 210500 "Common Work Results for Fire Suppression."
 - a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - b. Description: Single speed with permanently lubricated ball bearings.
7. Base: Cast iron or steel with hole for electrical cable.
8. Nameplate: Permanently attached to pump and indicating capacity and characteristics.
9. Capacities and Characteristics:
 - a. Rated Capacity: **<Insert gpm (L/minute)>**.
 - b. Total Dynamic Head: **<Insert feet (kPa)>**.
 - c. Working Pressure: **<Insert psig (kPa)>**.
 - d. Inlet Column Size: **<Insert NPS (DN)>**.
 - e. Pump Column Length: **<Insert feet (m)>**.
 - f. Outlet Size: **<Insert NPS (DN)>**.
 - g. Flange: **[Class 125]<Insert class>**.
 - h. Suction Head Available at Pump: **<Insert feet (m)>**.
 - i. Motor Horsepower: **<Insert value>**.
 - j. Motor Speed: **<Insert rpm>**.
 - k. Electrical Characteristics:
 - 1) Volts: **[120][208]<Insert value>**.
 - 2) Phases: **[Single][Three]**.
 - 3) Hertz: **[60]<Insert value>**.
 - 4) Full-Load Amperes: **<Insert value>**.
 - 5) Minimum Circuit Ampacity: **<Insert value>**.
 - 6) Maximum Overcurrent Protection: **<Insert amperage>**.
 - l. Pump-Start, Pressure-Switch Setting: **<Insert psig (kPa)>**.
 - m. Pump-Stop, Pressure-Switch Setting: **<Insert psig (kPa)>**.

2.3 PRESSURE-MAINTENANCE PUMP CONTROLLERS

A. Pressure-Maintenance Pump Controller:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Eaton]**
 - b. **[Firetrol]**

- c. [Master Control Systems, Inc]
 - d. [Metron Eledyne; a Hubbell Company]
 - e. [Tornatech]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Eaton]
 - b. [Firetrol]
 - c. [Master Control Systems, Inc]
 - d. [Metron Eledyne; a Hubbell Company]
 - e. [Tornatech]
 - f. <Insert manufacturer's name>
- 3. Source Limitations: Obtain pressure-maintenance pump controllers from a single manufacturer.
- 4. Description:
 - a. Type: UL 508A, factory-assembled, -wired, and -tested, across-the-line controller; for combined automatic and manual operation.
 - b. Enclosure: NEMA, Type 2 for wall mounting.
 - c. Finish: Manufacturer's standard color paint.
- 5. Standards:
 - a. Listed in accordance with UL 508A.
 - b. <Insert standard>.
- 6. Rate controller for scheduled horsepower and include the following:
 - a. Fusible disconnect switch.
 - b. Pressure switch.
 - c. Hand-off-auto selector switch.
 - d. Pilot light.
 - e. Running period timer.

2.4 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink and recommended for interior and exterior applications.
- C. Design Mix: **5000 psi (34 MPa)**, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, surface to receive equipment, equipment bases and anchorage provisions, with Installing Contractor(s), **[Architect][engineer][Construction Manager][and]** Manufacturer's Representative present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the pressure-maintenance pump and pressure-maintenance pump controller.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before pressure-maintenance pump installation.
- C. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION OF PRESSURE-MAINTENANCE PUMP CONTROLLERS

- A. Replace pressure-maintenance pump controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.3 INSTALLATION OF PRESSURE-MAINTENANCE PUMPS

- A. Comply with NFPA 20 for installation of pressure-maintenance pumps.
- B. Equipment Mounting:
 - 1. Install multistage pressure-maintenance pumps in accordance with HI 1.4.
 - 2. Install vertical-turbine, pressure-maintenance pumps in accordance with HI 2.4.
 - 3. Install base-mounted pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 4. Comply with requirements for vibration isolation and seismic control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
 - 5. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
- C. Support piping and pumps separately, so weight of piping does not rest on pumps.
- D. Install isolation valves in both inlet and outlet pipes near the pump. Comply with requirements for valves specified in Section 211000 "Water-Based Fire-Suppression Systems."
- E. Install piping hangers and supports, anchors, valves, gauges, and equipment supports in accordance with NFPA 20 **[NFPA 13][and][NFPA 14]<Insert standard>**.
- F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 PIPING CONNECTIONS

- A. Comply with requirements for piping and valves specified in Section 211000 "Water-Based Fire-Suppression Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect pressure-maintenance pumps to their controllers

3.5 INSTALLATION OF PRESSURE-MAINTENANCE-PUMP CONTROLLERS

- A. Coordinate installation of controllers with other construction, including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of pressure-maintenance-pump drivers.
- B. Connect controllers to their dedicated pressure-sensing lines.
- C. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than **79 inches (2 m)** above finished floor, and bottom of enclosure not less than **12 inches (305 mm)** above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- D. Seismic Bracing: Comply with requirements specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" and Section 018123 "Facility Seismic and Wind Criteria."
- E. Installation of Power Wiring:
 - 1. Install power wiring between pressure-maintenance-pump controllers and their services or sources, and between pressure-maintenance-pump controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70 (including Article 695, "Fire Pumps"), and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Field-Acceptance Testing and Inspection.
 - 1. Acceptance Testing Preparation:
 - a. Inspect and Test Each Component:
 - 1) Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
 - 2) Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
 - 3) Test continuity of each circuit.
 - b. Verify and Test Each Electric-Drive Controller:
 - 1) Verify that voltages at controller locations are within 1 percent of motor nameplate rated voltages, with motors off. If outside this range for motor, notify **[Architect][Construction Manager][Owner]** before starting the motor(s).
 - 2) Test each motor for proper phase rotation.

- 3) Verify short-circuit current rating.
 - c. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - d. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 2. Acceptance tests and inspections must be witnessed by **[Architect][Construction Manager][Owner][authorities having jurisdiction]<Insert names or titles of witnesses>**.
 3. Acceptance Tests and Inspections:
 - a. Do not begin field-acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to **[Architect][Construction Manager][Owner]** and authorities having jurisdiction.
 - b. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
 - c. Engage manufacturer's factory-authorized service representative to be present during the testing.
 - d. Perform field-acceptance tests as outlined in NFPA 20.
 4. Nonconforming Work:
 - a. Controllers will be considered defective if they do not pass tests and inspections.
 - b. Remove and replace defective units with new units and retest.
 5. Prepare and submit field-acceptance testing and inspection reports.
- 3.6 STARTUP SERVICE FOR PRESSURE-MAINTENANCE PUMPS AND CONTROLLERS
- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 2. **<Insert startup steps>**.
- 3.7 ADJUSTING
- A. Adjust pressure-maintenance-pump controllers to function smoothly and as recommended by manufacturer.
- B. Set field-adjustable pressure switches, auxiliary relays, time-delay relays, and timers.
- C. Program microprocessors for required operational sequences, status indications, alarms, event recordings, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- D. Lubricate pumps as recommended by manufacturer.
- 3.8 FIELD QUALITY CONTROL
- A. Test each pressure-maintenance pump with its controller as a unit.

- B. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
 - 2. Test in accordance with NFPA 20 for acceptance and performance testing.
 - a. Prior to initial startup and acceptance testing, complete and check all electric wiring serving pressure-maintenance pump motor and interwiring, normal power, and alternate power.
 - b. Perform arc flash risk assessment for all electric pressure-maintenance pump controllers in accordance with NFPA 70E or other code required by authorities having jurisdiction.
 - c. Field label electric pressure-maintenance pump controllers for arc flash risk in accordance with NFPA 70E or other code required by authorities having jurisdiction.
 - 3. Leak Test: After installation, fill system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

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Task	Specification	Specification Description
21 34 13 00	01 91 13 00a	Commissioning Of Fire Suppression



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Task	Specification	Specification Description
22 01 40 81	22 45 00 00	Emergency Plumbing Fixtures



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SECTION 22 05 00 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Medical compressed-air packaged system.
2. Instrument compressed-air packaged system.
3. Air compressor packaged system - reciprocating, oil less.
4. Air compressor packaged system - liquid ring.
5. Air compressor packaged system - rotary screw.
6. Air compressor packaged system - scroll.
7. Air compressor packaged system - diaphragm.
8. Air filters - inlet type.
9. Compressed-air dryers - refrigerated.
10. Compressed-air dryers - desiccant.
11. Compressed-air purification systems.
12. Compressed-air filter assemblies.
13. Dental compressed-air packaged system.
14. Dental compressed-air system control panels.

1.2 DEFINITIONS

- A. Actual Air: Air delivered at air compressor outlet. Flow rate is compressed air delivered and measured in **acfm (actual L/s)**.
- B. Laboratory Air Equipment: Compressed-air equipment and accessories for laboratory facilities.
- C. Medical Air Equipment: Compressed-air equipment and accessories for **[medical][dental][and][instrument]** compressed air for healthcare facilities.
- D. Standard Air: Free air at **68 deg F (20 deg C)** and **1 atmosphere (29.92 in. Hg)** before compression or expansion and measured in **scfm (standard L/s)**.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Medical compressed-air packaged system.
2. Instrument compressed-air packaged system.
3. Air compressor packaged system - reciprocating, oil less.
4. Air compressor packaged system - liquid-ring.
5. Air compressor packaged system - rotary screw.
6. Air compressor packaged system - scroll.
7. Air compressor packaged system - diaphragm.
8. Air filters - inlet type.
9. Compressed-air dryers - refrigerated.
10. Compressed-air dryers - desiccant.

11. Compressed-air purification systems.
12. Compressed-air filter assemblies.
13. Dental compressed-air packaged system.
14. Dental compressed-air system control panels.

B. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Plans, elevations, sections, and **[mounting][attachment]** details.
2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Diagrams for power, signal, and control wiring.

D. Delegated Design Submittals:

1. Detail fabrication and assembly of supports.
2. Include design calculations for selecting vibration isolators **[and seismic restraints]** and for designing vibration isolation bases, indicated to comply with performance requirements and design criteria, including analysis data **[signed and sealed by the qualified professional engineer responsible for their preparation]**.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates for air compressors, accessories, and components from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Qualification Statements: For **[Installer][and][testing agency]**.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressed-air equipment.

1. Indicate actual installed items by marking the submittals with an arrow or box.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Air Compressor, Inlet-Air Filter Elements: Equal to **<Insert number>** percent of quantity installed, but no fewer than **<Insert number>** units.
 - 2. Belts: [**One**][**Two**]**<Insert number>** for each belt-driven compressor.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Compressed-Air Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with the requirements indicated:
 - 1. Notify [**Architect**][**Construction Manager**][**Owner**] no fewer than [**seven**]**<Insert number>** days in advance of proposed interruption of compressed-air service.
 - 2. Do not proceed with interruption of compressed-air service without [**Architect's**][**Construction Manager's**][**Owner's**] written permission.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for delivery, storage, and handling.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Laboratory Air Equipment for Laboratory Facilities: An employer of workers trained and approved by manufacturer.
 - 2. Medical Air Equipment for Healthcare Facilities: Qualify installers in accordance with ASSE 6010.
- B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the compressed-air equipment testing indicated, that is[**a member of the Medical Gas Professional Healthcare Organization or is**] an NRTL and that is acceptable to authorities having jurisdiction.
 - 1. Qualify testing personnel in accordance with ASSE 6020 for inspectors and ASSE 6030 for verifiers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 99, "Health Care Facilities Code," for compressed-air equipment and accessories for medical and dental compressed-air systems.
- C. ASME Compliance: Fabricate and label receivers to comply with 2021 ASME Boiler and Pressure Vessel Code.
- D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design compressed-air equipment mounting.
- E. Seismic Performance: Compressed-air equipment to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>.[See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."]**
 - 1. The term "withstand" means the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
 - 2. Component Importance Factor: **[1.5][1.0]**.
 - 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>.**

2.2 GENERAL REQUIREMENTS FOR COMPRESSED-AIR SYSTEMS

- A. Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.
- B. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.
 - 1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
 - 2. Motor Controllers: Full-voltage, combination-magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
 - 3. Control Voltage: 120 V ac or less, using integral control power transformer.
 - 4. Motor Overload Protection: Overload relay in each phase.
 - 5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
 - 6. Automatic control switches to **[alternate lead-lag air compressors for duplex][and][sequence lead-lag air compressors for three or more]** air compressors.
 - 7. Instrumentation: Include discharge-air and receiver pressure gauges, air-filter maintenance indicator, hour meter, air compressor discharge-air and coolant temperature gauges, and control transformer.
 - 8. Alarm Signal Device: For connection to alarm system to indicate when backup air compressor is operating.
 - 9. Provide 65k AIC SCCR rating.
- C. Receivers: Steel tank constructed in accordance with 2021 ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected air compressors and bearing appropriate code symbols.
 2. Interior Finish: Corrosion-resistant coating.
 3. Accessories: Include safety valve, pressure gauge, automatic drain, pressure regulator, and piped three-valve bypass with valves.
- D. Mounting Frame: Fabricate base and attachment to air compressor and components with reinforcement strong enough to resist movement during a seismic event when base is anchored to building structure.

2.3 MEDICAL COMPRESSED-AIR PACKAGED SYSTEM

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Allied Healthcare Products Inc.]**
 2. **[BeaconMedaes]**
 3. **[EMSE Corporation]**
 4. **[Ohio Medical Corporation]**
 5. **[Powerex, Inc.]**
 6. **[Tri-Tech Medical]**
 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Allied Healthcare Products Inc.]**
 2. **[BeaconMedaes]**
 3. **[EMSE Corporation]**
 4. **[Ohio Medical Corporation]**
 5. **[Powerex, Inc.]**
 6. **[Tri-Tech Medical]**
 7. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain medical compressed-air packaged system from single source from single manufacturer.
- D. Description: Medical compressed-air packaged system, factory assembled on a common base, factory tested, fully compliant with NFPA 99 and featuring single-point connections for electrical power, intake air, discharge air, and condensate drains. Components are to include compressor(s), receiver, dryer(s), filter/pressure regulator system, all interconnecting piping, power, and control wiring, and UL-labeled control system.
- E. Capacities and Characteristics:
1. Compressed-Air Service: Medical compressed air.
 2. Air Compressor(s): Oil-less **[duplex]<Insert number>**, **[scroll][or][reciprocating]<Insert type>**.
 3. Standard-Air Capacity of Each Air Compressor: **<Insert scfm (standard L/s)>** free air.
 4. Actual-Air Capacity of Each Air Compressor: **<Insert acfm (actual L/s)>** delivered.
 5. Discharge-Air Pressure: **[80 psig (550 kPa)][125 psig (860 kPa)][175 psig (1200 kPa)]<Insert value>**.
 6. Intake-Air Temperature: **<Insert deg F (deg C)>**.
 7. Discharge-Air Temperature: **<Insert deg F (deg C)>**.
 8. Mounting: **[Freestanding][Tank mounted]**.
 9. Motor (Each Air Compressor):

- a. Horsepower: **<Insert value>**.
 - b. Speed: **[1750][3400]<Insert speed>** rpm.
10. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.
11. Receiver:
 - a. Orientation: **[Horizontal][Vertical]** arrangement.
 - b. Capacity: **<Insert gal. (L)>**.
 - c. Interior Finish: **[Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>**.
 - d. Pressure Rating: **[100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)][200 psig (1380 kPa)]<Insert value>** minimum.
 - e. Pressure Regulator Setting: **<Insert psig (kPa)>**.
 - f. Pressure Relief Valve Setting: **<Insert psig (kPa)>**.
 - g. Drain: **[Automatic][Manual]** valve.
12. Compressed-Air Dryer: **[Desiccant][Refrigerated]**.
 - a. Description:
 - 1) Twin-tower unit with purge system, mufflers, and capability to deliver **[plus 10 deg F (minus 12 deg C)]<Insert temperature>**, **100 psig (690 kPa)** air at dew point. Include dew point controlled purge, step-down transformers, disconnect switches, inlet and outlet pressure gauges, thermometers, automatic controls, and filters.
 - 2) Noncycling, air-cooled, electric-motor-driven unit with steel enclosure and capability to deliver **35 deg F (2 deg C)**, **100 psig (690 kPa)** air at dew point. Include automatic ejection of condensate from airstream, step-down transformers, disconnect switches, inlet and outlet pressure gauges, thermometers, automatic controls, and filters.
 - b. Capacities and Characteristics:
 - 1) Standard-Air Capacity of Each Compressed-Air Dryer: **<Insert scfm (standard L/s)>** free air.
 - 2) Pressure: **<Insert psig (kPa)>**.
 - 3) Entering-Air Temperature: **<Insert deg F (deg C)>**.
 - 4) Leaving-Air Temperature: **<Insert deg F (deg C)>**.
 - 5) Leaving-Air Pressure Dew Point: **<Insert deg F (deg C)>**.
 - 6) Ambient-Air Temperature: **<Insert deg F (deg C)>**.
 - 7) Maximum Air-Pressure Drop: **<Insert psig (kPa)>**.
 - 8) Inlet Filter: **[5]<Insert number>** micrometers.
 - 9) Outlet Filter: **[1]<Insert number>** micrometer(s).
 - 10) Motor Horsepower: **<Insert value>**.
 - 11) Electrical Characteristics:
 - a) Volts: **<Insert value>**.
 - b) Phase(s): **[Single][Three]**.
 - c) Hertz: **[60]<Insert value>**.

- d) Full-Load Amperes: <Insert value>.
 - e) Minimum Circuit Ampacity: <Insert value>.
 - f) Maximum Overcurrent Protection: <Insert amperage>.
13. Compressed-air filter and purification system.
14. Control System:
- a. Description: Duplex mounted and wired control system.
 - 1) UL labeled.
 - 2) NEMA ICS 6, Type 12 control panel enclosure.
 - 3) Circuit-breaker disconnects for each motor with external operators.
 - 4) Full voltage motor starters with overload protection.
 - 5) 24 V control circuit.
 - 6) 65k AIC SCCR rating.
 - 7) Touchscreen controls.
 - 8) Screen displays and functions (to include, but not limited to, the following):
 - a) Service alerts.
 - b) Runtime hours.
 - c) System status.
 - d) System pressure level.
 - e) Dew point level.
 - f) CO level.
 - g) Event logs.
 - h) <Insert type>.
 - 9) Ethernet connectivity with embedded web page for remote monitoring.
 - 10) Integral connectivity to the medical gas network via Ethernet.
 - 11) Optional connectivity - BACnet communication with TCP/IP protocol.

2.4 INSTRUMENT COMPRESSED-AIR PACKAGED SYSTEM

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- 1. **[Allied Healthcare Products Inc.]**
 - 2. **[BeaconMedaes]**
 - 3. **[EMSE Corporation]**
 - 4. **[Ohio Medical Corporation]**
 - 5. **[Powerex, Inc.]**
 - 6. **[Tri-Tech Medical]**
 - 7. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1. **[Allied Healthcare Products Inc.]**
 - 2. **[BeaconMedaes]**
 - 3. **[EMSE Corporation]**
 - 4. **[Ohio Medical Corporation]**
 - 5. **[Powerex, Inc.]**
 - 6. **[Tri-Tech Medical]**
 - 7. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain instrument compressed-air packaged system from single source from single manufacturer.
- D. Description: Instrument compressed-air packaged system, factory assembled on a common base, factory tested, fully compliant with NFPA 99 and featuring single-point connections for electrical power, intake air, discharge air, and condensate drains. Components are to include compressor(s), receiver, dryer(s), filter/pressure regulator system, all interconnecting piping, power, and control wiring, and UL-labeled control system.
- E. Capacities and Characteristics:
1. Compressed-Air Service: Instrument compressed air.
 2. Air Compressor(s): **[Duplex]<Insert number>, [reciprocating]<Insert type>**.
 3. Standard-Air Capacity of Each Air Compressor: **<Insert scfm (standard L/s)> free air.**
 4. Actual-Air Capacity of Each Air Compressor: **<Insert acfm (actual L/s)> delivered.**
 5. Discharge-Air Pressure: **[125 psig (860 kPa)][175 psig (1200 kPa)]<Insert value>**.
 6. Intake-Air Temperature: **<Insert deg F (deg C)>**.
 7. Discharge-Air Temperature: **<Insert deg F (deg C)>**.
 8. Mounting: **[Freestanding][Tank mounted]**.
 9. Motor (Each Air Compressor):
 - a. Horsepower: **<Insert value>**.
 - b. Speed: **[1750][3400]<Insert speed> rpm.**
 10. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.
 11. Receiver:
 - a. Orientation: **[Horizontal][Vertical]** arrangement.
 - b. Capacity: **<Insert gal. (L)>**.
 - c. Interior Finish: **[Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>**.
 - d. Pressure Rating: **[250 psig (1725 kPa)]<Insert value> minimum.**
 - e. Pressure Regulator Setting: **<Insert psig (kPa)>**.
 - f. Pressure Relief Valve Setting: **<Insert psig (kPa)>**.
 - g. Drain: **[Automatic][Manual]** valve.
 12. Compressed-Air Dryer: **[Desiccant]<Insert type>**.
 - a. Description: Twin-tower unit with purge system, mufflers, and capability to deliver **[plus 10 deg F (minus 12 deg C)]<Insert temperature>, 100 psig (690 kPa)** air at dew point. Include dew point controlled purge, step-down transformers, disconnect switches, inlet and outlet pressure gauges, thermometers, automatic controls, and filters.
 - b. Capacities and Characteristics:
 - 1) Standard-Air Capacity of Each Compressed-Air Dryer: **<Insert scfm (standard L/s)> free air.**
 - 2) Pressure: **<Insert psig (kPa)>**.
 - 3) Entering-Air Temperature: **<Insert deg F (deg C)>**.

- 4) Leaving-Air Temperature: <Insert deg F (deg C)>.
- 5) Leaving-Air Pressure Dew Point: <Insert deg F (deg C)>.
- 6) Ambient-Air Temperature: <Insert deg F (deg C)>.
- 7) Maximum Air-Pressure Drop: <Insert psig (kPa)>.
- 8) Inlet Filter: [5]<Insert number> micrometers.
- 9) Outlet Filter: [1]<Insert number> micrometer(s).
- 10) Motor Horsepower: <Insert value>.
- 11) Electrical Characteristics:
 - a) Volts: <Insert value>.
 - b) Phase(s): [Single][Three].
 - c) Hertz: [60]<Insert value>.
 - d) Full-Load Amperes: <Insert value>.
 - e) Minimum Circuit Ampacity: <Insert value>.
 - f) Maximum Overcurrent Protection: <Insert amperage>.

13. Compressed-air filter and purification system.

14. Control System:

a. Description: Duplex mounted and wired control system.

- 1) UL labeled.
- 2) NEMA ICS 6, Type 12 control panel enclosure.
- 3) Circuit-breaker disconnects for each motor with external operators.
- 4) Full voltage motor starters with overload protection.
- 5) 24 V control circuit.
- 6) 65k AIC SCCR rating.
- 7) Touchscreen controls.
- 8) Screen displays and functions (to include, but not limited to, the following):
 - a) Service alerts.
 - b) Runtime hours.
 - c) System status.
 - d) System pressure level.
 - e) Dew point level.
 - f) CO level.
 - g) Event logs.
 - h) <Insert type>.
- 9) Ethernet connectivity with embedded web page for remote monitoring.
- 10) Integral connectivity to the medical gas network via Ethernet.
- 11) Optional connectivity - BACnet communication with TCP/IP protocol.

2.5 AIR COMPRESSOR PACKAGED SYSTEM - RECIPROCATING, OIL LESS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Allied Healthcare Products Inc.]
2. [Atlas Copco]
3. [EMSE Corporation]
4. [FS-Curtis]
5. [Ohio Medical Corporation]
6. [Powerex, Inc.]

7. [Tri-Tech Medical]
 8. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Allied Healthcare Products Inc.]
 2. [Atlas Copco]
 3. [EMSE Corporation]
 4. [FS-Curtis]
 5. [Ohio Medical Corporation]
 6. [Powerex, Inc.]
 7. [Tri-Tech Medical]
 8. <Insert manufacturer's name>
- C. Source Limitations: Obtain reciprocating, oil-less, air compressors from single source from single manufacturer.
- D. Description: Packaged system.
- E. Compressor(s): [Single][or][two]-stage, oil-less (nonlubricated), reciprocating-piston type, with sealed oil-free bearings, that will deliver air of quality equal to intake air.
1. High discharge-air temperature switch.
 2. Belt guard totally enclosing pulleys and belts.
 3. Intercooler between stages of two-stage units.
- F. Receiver and accessories.
- G. Capacities and Characteristics:
1. Compressed-Air Service: [Dental][Laboratory]<Insert service> air.
 2. Air Compressor(s): [Simplex][Duplex]<Insert number>.
 3. Standard-Air Capacity of Each Air Compressor: <Insert scfm (standard L/s)> free air.
 4. Actual-Air Capacity of Each Air Compressor: <Insert acfm (actual L/s)> delivered.
 5. Discharge-Air Pressure: [80 psig (550 kPa)][125 psig (860 kPa)][175 psig (1200 kPa)]<Insert value>.
 6. Intake-Air Temperature: <Insert deg F (deg C)>.
 7. Discharge-Air Temperature: <Insert deg F (deg C)>.
 8. Mounting: [Freestanding][Tank mounted].
 9. Motor (Each Air Compressor):
 - a. Horsepower: <Insert value>.
 - b. Speed: [1750][3400]<Insert speed> rpm.
 10. Electrical Characteristics:
 - a. Volts: <Insert value>.
 - b. Phase(s): [Single][Three].
 - c. Hertz: [60]<Insert value>.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.
 11. Receiver:

- a. Orientation: **[Horizontal][Vertical]** arrangement.
- b. Capacity: **<Insert gal. (L)>**.
- c. Interior Finish: **[Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>**.
- d. Pressure Rating: **[100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)][200 psig (1380 kPa)]<Insert value>** minimum.
- e. Pressure Regulator Setting: **<Insert psig (kPa)>**.
- f. Pressure Relief Valve Setting: **<Insert psig (kPa)>**.
- g. Drain: **[Automatic][Manual]** valve.

2.6 AIR COMPRESSOR PACKAGED SYSTEM - LIQUID RING

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Flowserve SIHI]**
 2. **[Nash; an Ingersoll Rand Business]**
 3. **[Travaini Pumps USA, Inc]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Flowserve SIHI]**
 2. **[Nash; an Ingersoll Rand Business]**
 3. **[Travaini Pumps USA, Inc]**
 4. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain liquid-ring air compressors from single source from single manufacturer.
- D. Description: Packaged system.
- E. Compressor(s): Nonpulsating, rotary, liquid-ring type.
1. Construction: **[Cast-iron body with bronze rotor][Bronze body and rotor][Cast-iron or bronze body and bronze rotor]**.
 2. Coupling: Nonlubricated, flexible type.
 3. Sealing Fluid: Potable water.
- F. Capacities and Characteristics:
1. Compressed-Air Service: **[Laboratory]<Insert service>** air.
 2. Compressor(s): **[Simplex][Duplex]<Insert number>**.
 3. Standard-Air Capacity of Each Air Compressor: **<Insert scfm (standard L/s)>** free air.
 4. Actual-Air Capacity of Each Air Compressor: **<Insert acfm (actual L/s)>** delivered.
 5. Discharge-Air Pressure: **[80 psig (550 kPa)][100 psig (690 kPa)]<Insert value>**.
 6. Intake-Air Temperature: **<Insert deg F (deg C)>**.
 7. Discharge-Air Temperature: **<Insert deg F (deg C)>**.
 8. Mounting: **[Freestanding][Tank mounted]**.
 9. Motor (Each Air Compressor):
 - a. Horsepower: **<Insert value>**.
 - b. Speed: **[1750][3400]<Insert speed>** rpm.
 10. Electrical Characteristics:

- a. Volts: **<Insert value>**.
- b. Phase(s): **[Single][Three]**.
- c. Hertz: **[60]<Insert value>**.
- d. Full-Load Amperes: **<Insert value>**.
- e. Minimum Circuit Ampacity: **<Insert value>**.
- f. Maximum Overcurrent Protection: **<Insert amperage>**.

11. Receiver: ASME construction steel tank.

- a. Orientation: **[Horizontal][Vertical]** arrangement.
- b. Capacity: **<Insert gal. (L)>**.
- c. Interior Finish: **[Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>**.
- d. Pressure Rating: **[100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert value>** minimum.
- e. Pressure Regulator Setting: **<Insert psig (kPa)>**.
- f. Pressure Relief Valve Setting: **<Insert psig (kPa)>**.
- g. Drain: **[Automatic][Manual]** valve.

2.7 AIR COMPRESSOR PACKAGED SYSTEM - ROTARY SCREW

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Atlas Copco]**
2. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Atlas Copco]**
2. **<Insert manufacturer's name>**

C. Source Limitations: Obtain rotary-screw air compressors from single source from single manufacturer.

D. Description: Packaged system.

E. Air Compressor(s): Single-stage, oil-free, rotary-screw type with nonlubricated helical screws and lubricated gearbox, and of construction that prohibits oil from entering compression chamber.

1. Cooling/Lubrication System: Unit-mounted, air-cooled exchanger package prepiped to unit; with air-pressure circulation system with coolant stop valve, full-flow coolant filter, and thermal-bypass valve.
2. Air Filter: Dry type, with maintenance indicator and cleanable replaceable filter element.
3. Air/Coolant Receiver and Separation System: **150 psig (1035 kPa)** rated steel tank with ASME safety valve, coolant-level gauge, multistage air-coolant separator element, minimum pressure valve, blowdown valve, discharge check valve, coolant stop valve, full-flow coolant filter, and thermal-bypass valve.
4. Capacity Control: Capacity modulation between zero and 100 percent air delivery, with operating pressures between **50 and 100 psig (345 and 690 kPa)**. Include necessary control to hold constant pressure. When air demand is zero, unload compressor by using pressure switch and blowdown valve.

- a. Mounting: Freestanding.

- F. Sound-attenuation enclosure.
- G. Capacities and Characteristics:
 - 1. Compressed-Air Service: **[Dental][Laboratory]<Insert service>** air.
 - 2. Air Compressor(s): **[Simplex][Duplex]<Insert number>**.
 - 3. Standard-Air Capacity of Each Air Compressor: **<Insert scfm (standard L/s)>** free air.
 - 4. Actual-Air Capacity of Each Air Compressor: **<Insert acfm (actual L/s)>** delivered.
 - 5. Discharge-Air Pressure: **[80 psig (550 kPa)][110 psig (760 kPa)]<Insert value>**.
 - 6. Intake-Air Temperature: **<Insert deg F (deg C)>**.
 - 7. Discharge-Air Temperature: **<Insert deg F (deg C)>**.
 - 8. Motor (Each Air Compressor):
 - a. Horsepower: **<Insert value>**.
 - b. Speed: **[1750][3400]<Insert speed>** rpm.
 - 9. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.
 - 10. Receiver: ASME construction steel tank.
 - a. Orientation: **[Horizontal][Vertical]** arrangement.
 - b. Capacity: **<Insert gal. (L)>**.
 - c. Interior Finish: **[Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>**.
 - d. Pressure Rating: **[100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert value>** minimum.
 - e. Pressure Regulator Setting: **<Insert psig (kPa)>**.
 - f. Pressure Relief Valve Setting: **<Insert psig (kPa)>**.
 - g. Drain: **[Automatic][Manual]** valve.

2.8 AIR COMPRESSOR PACKAGED SYSTEM - SCROLL

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Allied Healthcare Products Inc.]**
 - 2. **[BeaconMedaes]**
 - 3. **[Ohio Medical Corporation]**
 - 4. **[Powerex, Inc.]**
 - 5. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Allied Healthcare Products Inc.]**
 - 2. **[BeaconMedaes]**
 - 3. **[Ohio Medical Corporation]**
 - 4. **[Powerex, Inc.]**

5. <Insert manufacturer's name>

- C. Source Limitations: Obtain scroll air compressors from single source from single manufacturer.
- D. Description: Packaged system.
- E. Air Compressor(s): Single-stage, oil-free, rotary, oscillating-volute type of construction that prohibits oil from entering compression chamber.
 - 1. Mounting: Freestanding.
- F. Capacities and Characteristics:
 - 1. Compressed-Air Service: [Dental][Laboratory]<Insert service> air.
 - 2. Air Compressor(s): [Simplex][Duplex]<Insert number>.
 - 3. Standard-Air Capacity of Each Air Compressor: <Insert scfm (standard L/s)> free air.
 - 4. Actual-Air Capacity of Each Air Compressor: <Insert acfm (actual L/s)> delivered.
 - 5. Discharge-Air Pressure: [80 psig (550 kPa)][110 psig (760 kPa)]<Insert value>.
 - 6. Intake-Air Temperature: <Insert deg F (deg C)>.
 - 7. Discharge-Air Temperature: <Insert deg F (deg C)>.
 - 8. Motor (Each Air Compressor):
 - a. Horsepower: <Insert value>.
 - b. Speed: [1750][3400]<Insert speed> rpm.
 - 9. Electrical Characteristics:
 - a. Volts: <Insert value>.
 - b. Phase(s): [Single][Three].
 - c. Hertz: [60]<Insert value>.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.
 - 10. Receiver: ASME construction steel tank.
 - a. Orientation: [Horizontal][Vertical] arrangement.
 - b. Capacity: <Insert gal. (L)>.
 - c. Interior Finish: [Epoxy][Epoxy or galvanized][Galvanized]<Insert coating>.
 - d. Pressure Rating: [100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert value> minimum.
 - e. Pressure Regulator Setting: <Insert psig (kPa)>.
 - f. Pressure Relief Valve Setting: <Insert psig (kPa)>.
 - g. Drain: [Automatic][Manual] valve.

2.9 AIR COMPRESSOR PACKAGED SYSTEM - DIAPHRAGM

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [ACI Medical, Inc]
 - 2. [Air Dimensions, Inc.]
 - 3. [Gast Manufacturing Inc]

4. [KNF Neuberger, Inc]
 5. [Thomas; an Ingersoll Rand Business]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [ACI Medical, Inc]
 2. [Air Dimensions, Inc.]
 3. [Gast Manufacturing Inc]
 4. [KNF Neuberger, Inc]
 5. [Thomas; an Ingersoll Rand Business]
 6. <Insert manufacturer's name>
- C. Source Limitations: Obtain diaphragm air compressors from single source from single manufacturer.
- D. Description: Simplex, single-stage, oil-free diaphragm air compressor with nonlubricated compression chamber and lubricated or dry crankcase, and of construction that prohibits oil from entering compression chamber.
1. Option: Construction may be articulating-piston, reciprocating-piston, or rotary-sliding-vane type.
- E. Control: Adjustable pressure switch.
- F. Mounting: Freestanding.
- G. Capacities and Characteristics:
1. Compressed-Air Service: [Laboratory]<Insert service> air.
 2. Standard-Air Capacity of Air Compressor: <Insert scfm (standard L/s)> free air.
 3. Actual-Air Capacity of Air Compressor: <Insert acfm (actual L/s)> delivered.
 4. Discharge-Air Pressure: [10 psig (69 kPa)][15 psig (103 kPa)]<Insert value>.
 5. Intake-Air Temperature: <Insert deg F (deg C)>.
 6. Discharge-Air Temperature: <Insert deg F (deg C)>.
 7. Motor (Each Air Compressor):
 - a. Horsepower: <Insert value>.
 - b. Speed: [1750][3400]<Insert speed> rpm.
 8. Electrical Characteristics:
 - a. Volts: <Insert value>.
 - b. Phase(s): [Single][Three].
 - c. Hertz: [60]<Insert value>.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.
- 2.10 AIR FILTERS - INLET TYPE
- A. Air Filters - Inlet Type:
1. Source Limitations: Obtain inlet-type air filters from single source from single manufacturer.
 2. Combination inlet-air filter-silencer, suitable for remote installation, for each air compressor:

- a. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.
 - b. Capacity: Match capacity of air compressor, with collection efficiency of 99 percent retention of particles larger than 10 micrometers.
3. Combination inlet-air filter-silencer, suitable for remote installation, for multiple air compressors:
- a. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.
 - b. Capacity: Match total capacity of connected air compressors, with collection efficiency of 99 percent retention of particles larger than 10 micrometers.

2.11 COMPRESSED-AIR DRYERS - REFRIGERATED

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[Air/Tak, Inc]**
2. **[Atlas Copco]**
3. **[EMSE Corporation]**
4. **[FS-Curtis]**
5. **[Gardner Denver, an Ingersoll Rand business]**
6. **[Ingersoll Rand]**
7. **[Kaeser Compressors, Inc]**
8. **[Parker (Parker Hannifin)]**
9. **[Pioneer Air Systems, Inc]**
10. **[SPXFLOW, Air Treatment]**
11. **[Wilkerson Operations]**
12. **[Zeks Compressed Air Solutions]**
13. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Air/Tak, Inc]**
2. **[Atlas Copco]**
3. **[EMSE Corporation]**
4. **[FS-Curtis]**
5. **[Gardner Denver, an Ingersoll Rand business]**
6. **[Ingersoll Rand]**
7. **[Kaeser Compressors, Inc]**
8. **[Parker (Parker Hannifin)]**
9. **[Pioneer Air Systems, Inc]**
10. **[SPXFLOW, Air Treatment]**
11. **[Wilkerson Operations]**
12. **[Zeks Compressed Air Solutions]**
13. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain refrigerated compressed-air dryers from single source from single manufacturer.
- D. Description: Noncycling, air-cooled, electric-motor-driven unit with steel enclosure and capability to deliver **35 deg F (2 deg C), 100 psig (690 kPa)** air at dew point. Include automatic ejection of

condensate from airstream, step-down transformers, disconnect switches, inlet and outlet pressure gauges, thermometers, automatic controls, and filters.

E. Capacities and Characteristics:

1. Standard-Air Capacity of Each Compressed-Air Dryer: **<Insert scfm (standard L/s)>** free air.
2. Pressure: **<Insert psig (kPa)>**.
3. Entering-Air Temperature: **<Insert deg F (deg C)>**.
4. Leaving-Air Temperature: **<Insert deg F (deg C)>**.
5. Leaving-Air Pressure Dew Point: **<Insert deg F (deg C)>**.
6. Ambient-Air Temperature: **<Insert deg F (deg C)>**.
7. Maximum Air-Pressure Drop: **<Insert psig (kPa)>**.
8. Inlet Filter: **[5]<Insert number>** micrometers.
9. Outlet Filter: **[1]<Insert number>** micrometer(s).
10. Motor Horsepower: **<Insert value>**.
11. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.

2.12 COMPRESSED-AIR DRYERS - DESICCANT

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Air/Tak, Inc]**
2. **[BeaconMedaes]**
3. **[EMSE Corporation]**
4. **[FS-Curtis]**
5. **[Gardner Denver, an Ingersoll Rand business]**
6. **[Ingersoll Rand]**
7. **[Kaeser Compressors, Inc]**
8. **[Parker (Parker Hannifin)]**
9. **[Pioneer Air Systems, Inc]**
10. **[SPXFLOW, Air Treatment]**
11. **[Van Air Systems, Inc]**
12. **[Wilkerson Operations]**
13. **[Zeks Compressed Air Solutions]**
14. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Air/Tak, Inc]**
2. **[BeaconMedaes]**
3. **[EMSE Corporation]**
4. **[FS-Curtis]**
5. **[Gardner Denver, an Ingersoll Rand business]**
6. **[Ingersoll Rand]**
7. **[Kaeser Compressors, Inc]**

8. [Parker (Parker Hannifin)]
9. [Pioneer Air Systems, Inc]
10. [SPXFLOW, Air Treatment]
11. [Van Air Systems, Inc]
12. [Wilkerson Operations]
13. [Zeks Compressed Air Solutions]
14. <Insert manufacturer's name>

- C. Source Limitations: Obtain desiccant compressed-air dryers from single source from single manufacturer.
- D. Description: Twin-tower unit with purge system, mufflers, and capability to deliver **[plus 10 deg F (minus 12 deg C)]<Insert temperature>, 100 psig (690 kPa)** air at dew point. Include dew point controlled purge, step-down transformers, disconnect switches, inlet and outlet pressure gauges, thermometers, automatic controls, and filters.
- E. Capacities and Characteristics:
1. Standard-Air Capacity of Each Compressed-Air Dryer: **<Insert scfm (standard L/s)>** free air.
 2. Pressure: **<Insert psig (kPa)>**.
 3. Entering-Air Temperature: **<Insert deg F (deg C)>**.
 4. Leaving-Air Temperature: **<Insert deg F (deg C)>**.
 5. Leaving-Air Pressure Dew Point: **<Insert deg F (deg C)>**.
 6. Ambient-Air Temperature: **<Insert deg F (deg C)>**.
 7. Maximum Air-Pressure Drop: **<Insert psig (kPa)>**.
 8. Inlet Filter: **[5]<Insert number>** micrometers.
 9. Outlet Filter: **[1]<Insert number>** micrometer(s).
 10. Motor Horsepower: **<Insert value>**.
 11. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.

2.13 COMPRESSED-AIR PURIFICATION SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. [Allied Healthcare Products Inc.]
 2. [Donaldson Company, Inc.]
 3. [Parker (Parker Hannifin)]
 4. [Pioneer Air Systems, Inc]
 5. [SPXFLOW, Air Treatment]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. [Allied Healthcare Products Inc.]

2. **[Donaldson Company, Inc.]**
 3. **[Parker (Parker Hannifin)]**
 4. **[Pioneer Air Systems, Inc]**
 5. **[SPXFLOW, Air Treatment]**
 6. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain compressed-air purification systems from single source from single manufacturer.
- D. Description: Compressed-air purification system sized for maximum connected equipment capacity with coalescing, particulate, and activated-charcoal filters; compressed-air dryer; catalytic converter; gauges and thermometers; and controls.
- E. Include the following capabilities:
1. Removal of excessive moisture, solid particulates, oil and oil mist, carbon monoxide, and hydrocarbon vapors.
 2. Automatic ejection of condensate from airstream.
 3. Production of air complying with USP - NF for medical air.
 4. Capacity and dew point indicated, but not higher than **[35 deg F (2 deg C) at 100 psig (690 kPa)]<Insert temperature and value>**.
- F. Filters: Parallel duplex filters, each sized for maximum system demand, with valved bypass for filter servicing.
1. Inlet Filters: **[5]<Insert number>** micrometers.
 2. Outlet Filters: **[1]<Insert number>** micrometer(s).
- G. Accessories: Inlet and outlet pressure gauges, thermometers, safety valves, and shutoff valves; and automatic ejection of condensate from airstream.
- H. Differential Pressure Switch: Adjustable, diaphragm type, with electrical connections for alarm system, to indicate when air-pressure drop through filters rises to more than **2 psig (13.8 kPa)** greater than when new and clean.
1. Inlet Connection: From inlet to particulate filter.
 2. Outlet Connection: To outlet from final activated-charcoal filter.
- I. Compressed-Air Dryer: **[Twin-tower desiccant type with automatic controls, purge system, and mufflers][Noncycling refrigerant type]**.
- J. Capacities and Characteristics:
1. Standard-Air Capacity of Each Compressed-Air Purification System: **<Insert scfm (standard L/s)>** free air.
 2. Entering-Air Pressure: **<Insert psig (kPa)>**.
 3. Entering-Air Temperature: **<Insert deg F (deg C)>**.
 4. Leaving-Air Temperature: **<Insert deg F (deg C)>**.
 5. Leaving-Air Pressure Dew Point: **<Insert deg F (deg C)>**.
 6. Ambient-Air Temperature: **<Insert deg F (deg C)>**.
 7. Maximum Compressed-Air Pressure Drop: **<Insert psig (kPa)>**.
 8. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.

- d. Full-Load Amperes: **<Insert value>**.
- e. Minimum Circuit Ampacity: **<Insert value>**.
- f. Maximum Overcurrent Protection: **<Insert amperage>**.

2.14 COMPRESSED-AIR FILTER ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1. **[Arrow Pneumatics, Inc]**
- 2. **[Dollinger; Celeros Flow Technology]**
- 3. **[Donaldson Company, Inc.]**
- 4. **[EMSE Corporation]**
- 5. **[Ingersoll Rand]**
- 6. **[Parker (Parker Hannifin)]**
- 7. **[Pioneer Air Systems, Inc]**
- 8. **[SPXFLOW, Air Treatment]**
- 9. **[Van Air Systems, Inc]**
- 10. **[Zeks Compressed Air Solutions]**
- 11. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1. **[Arrow Pneumatics, Inc]**
- 2. **[Dollinger; Celeros Flow Technology]**
- 3. **[Donaldson Company, Inc.]**
- 4. **[EMSE Corporation]**
- 5. **[Ingersoll Rand]**
- 6. **[Parker (Parker Hannifin)]**
- 7. **[Pioneer Air Systems, Inc]**
- 8. **[SPXFLOW, Air Treatment]**
- 9. **[Van Air Systems, Inc]**
- 10. **[Zeks Compressed Air Solutions]**
- 11. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain compressed-air filter assemblies from single source from single manufacturer.

- D. Description: Filter assemblies suitable for compressed air, in parallel duplex arrangement. Size each assembly for maximum capacity of connected equipment and operating pressure of compressed-air system. Include automatic ejection of condensate from airstream, inlet and outlet pressure gauges, and shutoff valves.

- 1. Option: Factory-fabricated filter system consisting of three air filters equivalent to those specified, pipe, fittings, valves, differential pressure switch, and enclosure; and with additional automatic drain traps and gauges.

- E. Size filter assemblies for **[5 psig (34.5 kPa)]<Insert value>** maximum air-pressure drop when filters are new and clean, at system rated capacity, and at **100 psig (690 kPa)** pressure.

- F. Differential Pressure Switch: Adjustable, diaphragm type, with electrical connections for alarm system, to indicate when air-pressure drop through filters rises to more than **2 psig (13.8 kPa)** greater than

when new and clean.

- G. Particulate Filters: Collection efficiency of 98 percent retention of particles 1 micrometer and larger.
- H. Odor and Taste Filters: Vapor-absorbing, activated charcoal.
- I. Coalescing Filters: Collection efficiency of 99.9 percent retention of particles 0.3 micrometer and smaller.
- J. Include automatic drain trap for each filter.

2.15 DENTAL COMPRESSED-AIR PACKAGED SYSTEM

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Air Techniques]**
 - 2. **[DentalEZ]**
 - 3. **[Midmark Corp.]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Air Techniques]**
 - 2. **[DentalEZ]**
 - 3. **[Midmark Corp.]**
 - 4. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain dental compressed-air systems from single source from single manufacturer.
- D. Description: Factory-assembled, -tested, and -packaged; automatic, dental compressed-air system that will deliver air of quality at least equal to intake air; suitable for dental applications and capable of producing air at **[80 psig (550 kPa)]<Insert value>**.
- E. Air Compressor(s): Oil-less reciprocating type.
 - 1. Option: Construction may be oil-free, sliding-vane or scroll type.
- F. Compressor Controls: Adjustable, tank-mounted, pressure **[switches and alternator for duplex air compressors][switch for simplex air compressor]**.
- G. Check Valves: In discharge piping of each air compressor.
- H. Air Filter: Integral with air compressor or separate unit for field installation in compressed-air piping.
- I. Dryer:
 - 1. Desiccant type, integral with air compressor or separate unit for field installation in compressed-air piping.
 - 2. Refrigerated **[35 deg F (2 deg C)]<Insert temperature>** dew point, in cabinet with automatic controls, for remote installation. Include on-off switch, on light, inlet and outlet temperature indicators, high-temperature alarm, and rubber isolators on feet.

- J. Receiver: Steel tank rated for at least **100 psig (690 kPa)** with rubber isolators on feet.
 - 1. Pressure Regulator: Adjustable.
 - 2. Safety Valve: ASME relief valve with setting of **100 psig (690 kPa)** or less.
 - 3. Drain: **[Automatic][Manual]** valve.
- K. Cabinet: Enameled steel, with control panel with manual on-off switch, on light, and pressure gauge.
Refrigeration-type dryer may be separate with integral cabinet.]
- L. Capacities and Characteristics:
 - 1. Air Compressor(s): **[Simplex][Duplex]<Insert number>**.
 - 2. Standard-Air Capacity of Each Air Compressor: **<Insert scfm (standard L/s)>** free air.
 - 3. Actual-Air Capacity of Each Air Compressor: **<Insert acfm (actual L/s)>** delivered.
 - 4. Discharge-Air Pressure: **[80 psig (550 kPa)]<Insert value>**.
 - 5. Arrangement: **[Duplex, mounted on horizontal][Simplex, mounted on horizontal][Simplex, mounted on vertical]** receiver.
 - 6. Motor (Each Air Compressor):
 - a. Horsepower: **<Insert value>**.
 - b. Speed: **[1750][3400]<Insert speed>** rpm.
 - 7. Electrical Characteristics:
 - a. Volts: **<Insert value>**.
 - b. Phase(s): **[Single][Three]**.
 - c. Hertz: **[60]<Insert value>**.
 - d. Full-Load Amperes: **<Insert value>**.
 - e. Minimum Circuit Ampacity: **<Insert value>**.
 - f. Maximum Overcurrent Protection: **<Insert amperage>**.

2.16 DENTAL COMPRESSED-AIR SYSTEM CONTROL PANELS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Air Techniques]**
 - 2. **[DentalEZ]**
 - 3. **[Midmark Corp.]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Air Techniques]**
 - 2. **[DentalEZ]**
 - 3. **[Midmark Corp.]**
 - 4. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain dental compressed-air system control panels from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a

qualified testing agency, and marked for intended location and application.

- E. Description: Wall-mounted type with visual indicators to indicate equipment in operation and to perform the following:
 - 1. Shut off dental air equipment.
 - 2. Shut off water supply to dental air equipment. Include solenoid-operated valve for installation in water piping.
- F. Control panels may be combined with dental vacuum pump control panels in single dental equipment control panels.

2.17 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."
 - 1. Enclosure: **[Open, dripproof][Totally enclosed, fan cooled][Totally enclosed, air over][Open, externally ventilated][Totally enclosed, nonventilated][Severe duty][Explosion proof][Dust-ignition-proof machine].**
 - 2. Enclosure Materials: **[Cast iron][Cast aluminum][Rolled steel].**
 - 3. Motor Bearings: **<Insert requirements>.**
 - 4. Unusual Service Conditions:
 - a. Ambient Temperature: **<Insert deg C>.**
 - b. Altitude: **<Insert feet (meter)>** above sea level.
 - c. High humidity.
 - d. **<Insert conditions>.**
 - 5. Efficiency: Premium efficient.
 - 6. NEMA Design: **<Insert designation>.**
 - 7. Service Factor: **<Insert value>.**
 - 8. Electrical Characteristics:
 - a. Horsepower: **<Insert horsepower>.**
 - b. Volts: **[115][200][230][460]<Insert value>.**
 - c. Phase: **[Single][Poly].**
 - d. Hertz: **[60]<Insert value>.**
 - e. Full-Load Amperes: **<Insert value>.**
 - f. Minimum Circuit Ampacity: **<Insert value>.**
 - g. Maximum Overcurrent Protection: **<Insert amperage>.**

PART 3 - EXECUTION

3.1 PREPARATION

- A. Compressed-air equipment, accessories, and components are to be factory cleaned for oxygen service and sealed and furnished suitable for **[laboratory air][and][medical/instrument air]** applications, in accordance with CGA G-4.1, "Cleaning of Equipment for Oxygen Service."
- B. Compressed-air equipment, accessories, and components that have not been cleaned for oxygen service, or have been cleaned but become contaminated and unsuitable for **[laboratory air][and][medical/instrument air]** applications, are not to be used.

3.2 INSTALLATION OF COMPRESSED-AIR EQUIPMENT

A. General Requirements for Compressed-Air Equipment Installation:

1. Install compressed-air equipment to allow maximum headroom unless specific mounting heights are indicated.
2. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces unless otherwise indicated.
3. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
4. Install equipment to allow right of way for piping installed at required slope.
5. Install the following devices on compressed-air equipment:
 - a. Thermometer, Pressure Gauge, and Safety Valve: Install on each compressed-air receiver.
 - b. Pressure Regulators: Install downstream from air compressors, dryers, purification units, and filter assemblies.
 - c. Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain.

B. Laboratory Compressed-Air Equipment Installation:

1. Install compressed-air equipment, except wall-mounted equipment[**and diaphragm air compressors**], on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
3. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
4. Install diaphragm air compressors on [floor][counter]<Insert location>.
 - a. Anchor air compressors to surface in accordance with manufacturer's written instructions[**and seismic criteria applicable to Project**].

C. Medical Compressed-Air Equipment Installation:

1. Install in accordance with ASSE 6010 and NFPA 99.
2. Install compressed-air equipment, except wall-mounted equipment, on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
4. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

D. Dental Air System Equipment Installation:

1. Install in accordance with ASSE 6010 and NFPA 99.
2. Install dental air system units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
4. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

5. Maintain manufacturer's recommended clearances for service and maintenance.
6. Install control panels for dental compressed-air equipment on wall near [equipment][office entrance]<Insert location>.

3.3 PIPING CONNECTIONS

- A. Comply with requirements for water-supply piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements for drain piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Comply with requirements for compressed-air piping specified in Section 226113 "Compressed-Air Piping for Laboratory and Healthcare Facilities." Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance.
- E. Connect compressed-air piping to compressed-air equipment, accessories, and specialties with shutoff valve and union or flanged connection.
- F. Connect water supply to compressed-air equipment that requires water. Include backflow preventer. Backflow preventers are specified in Section 221119 "Domestic Water Piping Specialties."

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 IDENTIFICATION

- A. Identify laboratory compressed-air equipment system components. Comply with requirements for

identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

- B. Identify medical compressed-air equipment system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" and with NFPA 99.

3.7 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Check for lubricating oil in lubricated-type equipment.
 - 3. Check belt drives for proper tension.
 - 4. Verify that air compressor inlet filters and piping are clear.
 - 5. Check for equipment vibration-control supports and flexible pipe connectors, and verify that equipment is properly attached to substrate.
 - 6. Check safety valves for correct settings. Ensure that settings are higher than air compressor discharge pressure, but not higher than rating of system components.
 - 7. Check for proper seismic restraints.
 - 8. Drain receiver tank(s).
 - 9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 10. Test and adjust controls and safeties.
- B. Prepare written report documenting testing procedures and results.

3.8 ADJUSTING

- A. Adjust equipment to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.9 FIELD QUALITY CONTROL FOR HEALTHCARE FACILITY MEDICAL COMPRESSED-AIR EQUIPMENT

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Medical Compressed-Air Equipment Testing Coordination: Perform tests, inspections, verifications, and certification of medical compressed-air equipment concurrently with tests, inspections, and certification of **[medical vacuum equipment][medical vacuum piping][medical compressed-air piping][and][medical gas piping]** systems.
 - 2. Preparation: Perform medical compressed-air equipment tests in accordance with requirements in NFPA 99 for the following:
 - a. Air-quality purity test.
 - b. System operation test.
 - 3. Equipment Verification: Comply with requirements in ASSE 6020, ASSE 6030, and NFPA 99 for

- verification of medical compressed-air equipment.
 - 4. Replace damaged and malfunctioning controls and equipment.
 - 5. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
 - 6. Components will be considered defective if they do not pass tests and inspections and is to be replaced with new components.
- C. Prepare test and inspection reports.

3.10 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain air compressors[, **compressed-air dryers**][**compressed-air purification units**][**and**][**compressed-air filter assemblies**].

END OF SECTION 22 05 00 00

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SECTION 22 05 00 00A - TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. TAB of domestic water system.
2. TAB of plumbing equipment:
 - a. Domestic water booster pumps.
 - b. Domestic hot-water in-line circulation pumps.
 - c. General-duty air compressors.
 - d. Sanitary sewage pumps.
 - e. Drainage pumps.
 - f. Laboratory air compressors.
 - g. Laboratory vacuum pumps.
3. Pipe-leakage test verification.
4. Testing, adjusting, and balancing of existing plumbing systems and equipment.

B. Related Requirements:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for TAB of HVAC.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. FFT: Fast Fourier transform.
- C. INCE: Institute of Noise Control Engineering.
- D. NC: Noise criteria.
- E. NEBB: National Environmental Balancing Bureau.
- F. RC: Room criteria.
- G. TAB: Testing, adjusting, and balancing.
- H. TABB: Testing, Adjusting, and Balancing Bureau.
- I. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- J. TDH: Total dynamic head.

1.3 PREINSTALLATION MEETINGS

- A. TAB Conference: Conduct a TAB conference at **[Project site]<Insert location>** after approval of the TAB strategies and procedures plan, to develop a mutual understanding of the details. Provide a minimum of **[14]<Insert number>** days' advance notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Requirements for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.
 - e. **<Insert additional agenda items as required>**.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within **[30][60][90]<Insert number>** days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within **[30][60][90]<Insert number>** days of Contractor's Notice to Proceed, provide a summary report of the examination review required in "Examination" Article, if issues are discovered that may preclude the proper testing and balancing of the systems. Submit a summary report of the examination review required in "Examination" Article.
- C. Strategies and Procedures Plan: Within **[30][60][90]<Insert number>** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.
- D. System Readiness Checklists: Within **[30][60][90]<Insert number>** days of Contractor's Notice to Proceed, submit system readiness checklists, as specified in "Preparation" Article, to be used and filled out by systems installers verifying that systems are ready for TAB.
- E. Certified TAB Reports: Within **[14][21][30]<Insert number>** days of completion of testing and balancing work.
 - 1. Submit one copy of the final TAB report to the design professional of record's firm. Provide **[five]<Insert number>** additional copies to Contractor.
- F. Sample report forms.
- G. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration and calibration interval.

1.5 QUALITY ASSURANCE

- A. TAB Specialist Firm's Qualifications, Certified by AABC:

1. TAB Field Supervisor: Employee of the TAB specialist firm and certified by AABC.
 2. TAB Technician: Employee of the TAB specialist firm and certified by AABC.
- B. TAB Specialist Firm's Qualifications: Certified by **[NEBB][or][TABB]**.
1. TAB Certified Professional: Employee of the TAB specialist firm and certified by **[NEBB][or][TABB]**.
 2. TAB Technician: Employee of the TAB specialist firm and certified by **[NEBB][or][TABB]**.
 3. TAB specialist firm is to be independent, third-party, and unaffiliated with Contractor.
- C. Sound and Vibration Specialists: **[NEBB-certified Sound and Vibration Technician][TABB-certified Sound and Vibration Technician][INCE Board-certified professional][Vibration Institute Category I Certified Vibration Analyst][Vibration Institute Category II Certified Vibration Analyst][Vibration Institute Category III Certified Vibration Analyst][Vibration Institute Category IV Certified Vibration Analyst][or][Licensed professional engineer who specializes in acoustical engineering]<Insert sound and vibration certification>**.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- E. ASHRAE 111 Compliance: Requirements in ASHRAE 111 applicable to analogous domestic water system and plumbing equipment balancing.
- F. ASHRAE 188 Compliance: Comply with balancing and report requirements in Section 8.3, "Balancing."
- G. Code and Authorities Having Jurisdiction Compliance: Furnish TAB services that comply with governing codes and requirements of authorities having jurisdiction.
- 1.6 FIELD CONDITIONS
- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
 - B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 TAB SPECIALIST FIRMS

- A. Subject to compliance with requirements, **[engage one of the following][available TAB specialist firm that may be engaged include, but are not limited to, the following]**:
 1. **<Insert TAB specialist firm's name>**.

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in system designs that may preclude proper TAB of systems and equipment. Submit Contract

Documents Examination Report summary of findings.

- B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, and balancing valves and fittings. Note the locations of devices that are not accessible for TAB.
- C. Examine approved submittals for plumbing systems and equipment.
- D. Examine system and equipment installations, and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- E. Examine plumbing equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- F. Verify with installing Contractor that startup strainer screens have been replaced with permanent screens and that all strainers have been cleaned.
- G. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- H. Observe demonstration of operating safety interlocks and controls on plumbing equipment.
- I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Prepare system-readiness checklists of plumbing systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Domestic Water System:
 - a. Verify leakage and pressure tests on water distribution systems have been completed in accordance with applicable code and authority having jurisdiction.
 - b. Water heaters are installed and functioning.
 - c. Piping is complete and all points of outlet are installed.
 - d. Water treatment is complete.
 - e. Systems are flushed, filled, and air purged.
 - f. Strainers are clean.
 - g. Control valves are functioning in accordance with the sequence of operation.
 - h. Shutoff and balance valves are 100 percent open.
 - i. **[Booster-][and][hot-water circulating]** pumps are operational and proper rotation is verified.
 - j. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - k. Variable-frequency controllers' startup is complete, and safeties are verified.
 - l. Suitable access to balancing devices and equipment is provided.

2. Sanitary Sewage/Drainage System:
 - a. Leakage and pressure tests on sanitary sewage/drainage systems have been completed in accordance with applicable code and authority having jurisdiction requirements.
 - b. Piping is complete.
 - c. Sanitary sewage pumps/drainage pumps are operational.
 - d. Control valves are functioning in accordance with the sequence of operation.
 - e. Shutoff valves are 100 percent open.
 - f. Suitable access to equipment is provided.
3. Compressed-Air System:
 - a. Leakage and pressure tests on compressed air-distribution system have been satisfactorily completed in accordance with Div. 22 requirements.
 - b. Piping is complete and all points of outlet are installed.
 - c. Systems are flushed, filled, and air purged.
 - d. Strainers are clean.
 - e. Control valves are functioning in accordance with the sequence of operation.
 - f. Shutoff and balance valves are 100 percent open.
 - g. Compressors are operational and of proper rotation.
 - h. Gauge connections are installed directly at compressor inlet and outlet flanges prior to valves or strainers.
 - i. Variable-frequency controllers' startup is complete, and safeties are verified.
 - j. Suitable access to balancing devices and equipment is provided,
4. Vacuum System:
 - a. Leakage and pressure tests on vacuum system have been satisfactorily completed in accordance with Div. 22 requirements.
 - b. Piping is complete and all points of inlet are installed.
 - c. Systems are flushed, filled, and purged.
 - d. Strainers are clean.
 - e. Control valves are functioning in accordance with the sequence of operation.
 - f. Shutoff and balance valves are 100 percent open.
 - g. Vacuum pumps are operational and of proper rotation.
 - h. Gauge connections are installed directly at vacuum pump inlet and outlet flanges prior to valves or strainers.
 - i. Variable-frequency controllers' startup is complete, and safeties are verified.
 - j. Note location of balancing devices that aren't accessible.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in **[AABC's "National Standards for Total System Balance"]****[ASHRAE 111]****[NEBB's "Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems"]****[SMACNA's "HVAC Systems - Testing, Adjusting & Balancing"]****[SMACNA's "TAB Procedural Guide"]** applicable to analogous domestic water system and plumbing equipment balancing in this Section.
- B. Cut insulation, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
 1. Installing Contractor to Perform the Following:
 - a. Where holes for probes are required in piping or equipment, install pressure and temperature test plugs to seal systems.

- b. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 220716 "Plumbing Equipment Insulation" and Section 220719 "Plumbing Piping Insulation."

- C. Mark equipment and balancing devices, including valve position indicators and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in [inch-pound (IP)][and] units.
- E. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.5 GENERAL PROCEDURES FOR PLUMBING EQUIPMENT

- A. Test, adjust, and balance plumbing equipment indicated on Drawings, including, but not limited to, the following:
 - 1. Motors.
 - 2. Domestic water booster pumps.
 - 3. Domestic water in-line pumps.
 - 4. Domestic water heaters.
 - 5. Sanitary sewage pumps.
 - 6. Drainage pumps.
 - 7. Air compressors.
 - 8. Vacuum pumps.
 - 9. <Insert equipment>.

3.6 PROCEDURES FOR DOMESTIC WATER SYSTEMS

- A. Prepare test reports for pumps and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Cross-check the summation of required equipment flow rates with system design flow rates.
- B. Prepare schematic diagrams of systems' record Drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare domestic water systems for testing and balancing as follows:
 - 1. Check expansion tank for proper setting.
 - 2. Check water heater for proper discharge temperature setting.
 - 3. Check remotest point of outlet for adequate pressure.
 - 4. Check flow-control valves for proper position.
 - 5. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 - 6. Verify that motor controllers are equipped with properly sized thermal protection.
 - 7. Check that air has been purged from the system.
- D. Measure and record upstream and downstream pressure of each piece of equipment.
- E. Measure and record upstream and downstream pressure of pressure-reducing valves.
- F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

- G. Check settings and operation of each safety valve. Record settings.

3.7 PROCEDURES FOR COMPRESSED-AIR SYSTEMS

- A. Prepare test reports for air compressors and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Cross-check the summation of required equipment flow rates with system design flow rates.
- B. Prepare schematic diagrams of systems' record Drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare compressed-air systems for testing and balancing as follows:
 - 1. Check remotest point of outlet for adequate pressure.
 - 2. Check pressure-control valves for proper position.
 - 3. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 - 4. Verify that motor controllers are equipped with properly sized thermal protection.
- D. Measure and record upstream and downstream pressure of pressure-reducing valves.
- E. Check settings and operation of pressure-reducing valves. Record final settings.
- F. Check settings and operation of each safety valve. Record settings.

3.8 PROCEDURES FOR VACUUM SYSTEMS

- A. Prepare test reports for vacuum pumps and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Cross-check the summation of required equipment flow rates with system design flow rates.
- B. Prepare schematic diagrams of systems' record Drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare domestic water systems for testing and balancing as follows:
 - 1. Check remotest point of inlet for adequate vacuum.
 - 2. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 - 3. Verify that motor controllers are equipped with properly sized thermal protection.

3.9 PROCEDURES FOR DOMESTIC WATER SYSTEM BOOSTER PUMPS

- A. Adjust pumps to deliver total design flow.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
 - 2. Measure pump TDH as follows:

- a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, pump impellers are to be trimmed to reduce excess throttling.
 3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
 - B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
 - C. Verify final system conditions as follows:
 1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
 - D. Verify that memory stops have been set.
- 3.10 PROCEDURES FOR DOMESTIC HOT-WATER CIRCULATING INLINE PUMP
- A. Balance system with manual or automatic balancing valves by setting at design flow.
 1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
 - B. Adjust pump to deliver total design flow.
 1. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 2. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
 3. Mark final settings and verify that all memory stops have been set.
 4. Verify final system conditions as follows:

- a. Re-measure and confirm that total flow is within design.
- b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
- c. Mark final settings.

3.11 PROCEDURES FOR MOTORS

- A. Motors: **[1/2]<Insert value>** hp and larger; test at final balanced conditions and record the following data:
 1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation. Verify and report Hz at maximum and minimum flows.

3.12 PROCEDURES FOR WATER HEATERS

- A. Electric Water Heaters:
 1. Measure and record entering- and leaving-water temperatures.
 2. Measure and record water flow.
 3. Measure and record pressure drop.
 4. **[Measure and]**Record relief valve(s) pressure setting.
 5. Capacity: Calculate in **Btu/h (kW)** of heating output.
 6. Efficiency: Calculate operating efficiency for comparison to submitted equipment.
- B. Gas- and Oil-Fired Water Heaters:
 1. Measure and record entering- and leaving-water temperatures.
 2. Measure and record water flow.
 3. Measure and record pressure drop.
 4. **[Measure and]**Record relief valve(s) pressure setting.
 5. Capacity: Calculate in **Btu/h (kW)** of heating output.
 6. Fuel Consumption: If fuel supply is equipped with flow meter, measure and record consumption.
 7. Efficiency: Calculate operating efficiency for comparison to submitted equipment.
 8. Fan, motor, and motor controller operating data.

3.13 SOUND TESTS

- A. After systems are balanced and Substantial Completion, with all systems operating at normal conditions and with all spaces completed and finished for occupancy, measure and record sound levels at **[five][10][15]<Insert number>** locations as designated by Architect. All building mechanical, electrical, and plumbing equipment, which may affect sound readings, must be operational.
- B. Sound-Level Testing Meter Instrumentation - Minimum Requirements:
 1. Portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.

2. Capable of showing fluctuations at minimum and maximum levels and measuring the equivalent continuous sound pressure level (Leq).
3. Capable of using one-third octave band filters to measure frequencies from 31.5 Hz to 8000 Hz.
4. Accuracy of plus/minus two decibels.
5. Current NIST-traceable annual calibration. Calibrate instruments prior to taking measurements and after taking measurements each day of use.

C. Test Procedures - Indoors:

1. Measure and record sound levels at the following rooms:
 - a. **<Insert list of room numbers and names where sound testing is required>.**
2. For each room/location tested, select a measurement location that has the greatest anticipated sound level. If testing multiple locations for each room type, select at least one location that is near and at least one location that is remote from the predominant sound source.
3. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
4. Equipment is to be operating at design values.
5. Sound-testing firm is to have access to controls hardware, software, and onsite technical support at no cost to the sound-testing firm. The installing contractors are to provide a controlled, steady-state environment (flow, pressure, control, and temperature) during duration of sound testing.
6. Use a microphone suitable for the type of noise levels measured that is compatible with meter.
7. At each measurement location, record a set of background sound pressure levels, with fast time constant and minimum time duration of 60 seconds, in the eight unweighted octave bands **[63 Hz to 8000 Hz (NC)][31.5 Hz to 4000 Hz (RC)]** with the equipment off.
8. At each measurement location, record a set of sound pressure levels, with fast time constant and minimum time duration of 60 seconds, in the eight unweighted octave bands **[63 Hz to 8000 Hz (NC)][31.5 Hz to 4000 Hz (RC)]** with the equipment operating.
9. Take readings no closer than **36 inches (900 mm)** from a wall or from the operating equipment and approximately **48 inches (1200 mm)** from the floor, with the meter held or mounted on a tripod.

D. Reporting:

1. The final report is to contain the following information at a minimum:
 - a. Report Title Page: Page indicating Project name, names of Project Architect, engineer, HVAC Contractor, and sound measurement firm with names, addresses, and telephone numbers.
 - b. Report Certification Page: Page indicating Project name, sound measurement firm name, name of individual performing measurements, and all required sound technician certifications.
 - c. Table of Contents: Identify report sections and total number of pages in each section.
 - d. Report Summary/Remarks: Narrative description of system setup conditions, results, and deficiencies.
 - e. Instrument Calibration Section: List of instruments to be used to verify the reported data, containing the name/type of each instrument, manufacturer, model number, serial number, calibration date and dates of use, and NIST-traceable calibration certificates.
 - f. Sound Measurement Data Sheets: Record sound measurements on sound measurement report forms, indicating the decibel levels measured for both "background" and "building system operating" readings. Record each tested location on a separate NC or RC chart. Record the following information on the forms:
 - 1) Date and time of test.

- 2) Equipment Operational Parameters: Speed and frequency at time of measurements.
- 3) Indoor Measurements: Space location within the building, including floor level and room space number.
- 4) Outdoor Measurements: Location identifier such as location relative to equipment, building, or property line.
- 5) Indicate where measurements meet or exceed design criteria.

3.14 VIBRATION TESTS

- A. After systems are balanced and Substantially Completion, measure and record vibration levels on equipment having motor horsepower equal to or greater than **[3]<Insert number>[for pumps and fans],[5]<Insert number>[for chillers and compressors]**.
- B. Instrumentation:
 1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
 2. The meter is to automatically identify engineering units, frequency resolution, filter bandwidth, amplitude, and frequency scale values.
 3. The meter is to be able to measure machine vibration displacement in mils of deflection; velocity in inches per second (meters/sec); and acceleration in G's (or g-force), inches per second squared (G's, meters per second squared).
 4. Calibration of instrument and transducer must be NIST traceable and must be current during the time period measurements are being made. Vibration instruments and transducers must have NIST-traceable calibration every 12 months. Verify calibration date is current for vibration meter before taking readings.
- C. Pretest Procedures:
 1. Before any vibration measurements are made, confirm that the following items have been completed and any deficiencies found are reported to the appropriate parties for remedy:
 - a. Verify that all vibration isolators are installed in accordance with respective manufacturer's written instructions.
 - b. Verify that piping and conduit penetrations through plumbing equipment room envelope are sealed, and that there is no rigid contact with building structure.
 - c. Inspect steel isolation bases for cracked welds and bending/distorting of steel members.
 - d. Inspect concrete isolation bases for cracked concrete. Check isolator retainer brackets to be sure they are not loose. Concrete base must be flat and true level.
 - e. Examine elastomeric isolators for cracks in the rubber and for loose bonds between the rubber and the steel plates and other steel components. Verify clearance is provided between bolts and the side of bolt holes to prevent short circuiting.
 - f. Examine steel spring isolators for loose or missing bolts, nuts, and lock washers. Verify springs are not overloaded or underloaded, completely collapsed, or cocked. Verify rubber or glass-fiber pad between bottom steel spring plate and the concrete/supporting structure is in place.
 - g. Inspect isolators that have seismic restraint devices to make sure that all shims have been removed and supportive nuts have been properly adjusted to allow for free floating of the isolated system.
 - h. Verify that seismic restraints are not preventing proper functioning of vibration isolation function.
 - i. Verify space under isolated bases are clean and free of debris that could cause short-circuiting.
 - j. Verify that shipping bolts associated with spring isolators have been removed so that they do not short-circuit the system.

- k. Verify flexible piping, hoses, and expansion joint types, lengths, and locations are as specified.
- l. Verify that electrical and control connections do not restrain movement of the vibration-isolated equipment.
- m. Verify flexible connections between fans and ductwork "bellow" as designed when fans are operating.
- n. Verify that hanger isolator rods are free of misalignment and not in rigid contact with the hanger housing.

D. Test Procedures:

1. Perform vibration measurements when other building and outdoor vibration sources are at a minimum level and will not adversely influence measurements of equipment being tested.
2. Observe if there is equipment in the building that might interfere with testing. Note the equipment to the construction manager and request resolution before testing begins.
3. Take measurements when exterior vibration sources, such as trains, roadway traffic, adjacent construction activities, and the like, are at a minimum level.
4. Attach and secure vibration transducer in accordance with the most current edition of **[NEBB's "Procedural Standards for Measurement of Sound and Vibration."]**<Insert reference document.>
5. Measure and record vibration levels **[in at least 1.25 Hz increments over a minimum frequency range of 5 to 1000 Hz]**<Insert increment requirements>.
6. Measure and record acceleration and/or velocity and/or displacement readings on equipment; bearing and equipment base in the vertical, horizontal, and axial planes; or as per-contract specifications, where measurements can be performed safely and where measurement locations are accessible.

a. Pumps:

- 1) Pump Bearing: Drive end and opposite end.
- 2) Motor Bearing: Drive end and opposite end.
- 3) Equipment Base: Top and side, within **6 inches (152 mm)** of one isolator.
- 4) Building: Floor adjacent to pump/motor, within **6 inches (152 mm)** of one isolator; vertical axis only.

b. Compressors:

- 1) Compressor Bearing: Drive end and opposite end.
- 2) Motor Bearing: Drive end and opposite end.
- 3) Equipment Base: Top and side, within **6 inches (152 mm)** of one isolator.
- 4) Building: Floor adjacent to compressor/motor, within **6 inches (152 mm)** of one isolator; vertical axis only.

7. FFT Analyzer Settings:

- a. Windowing: Hanning.
- b. Averages: At least two.
- c. Frequency Range: 5 to 1,000 Hz (300 to 60,000 rpm).
- d. Frequency Resolution: At least 1.25 Hz (75 rpm).
- e. Line of Resolution: At least 800.
- f. Detection: Peak, peak-to-peak, or RMS.
- g. Averaging: Exponential.

E. Reporting:

1. Vibration Measurement Report Forms:
 - a. For each measurement location, record vibration measurements on appropriate test forms, showing the following information:
 - 1) Date of test.
 - 2) Equipment designation, location, motor horsepower, and equipment operational parameters (speed/frequency) at time of test.
 - 3) Measured acceleration, **[in units of g's (g-force), inches/seconds squared (meters/seconds squared)]<Insert units of measure>**.
 - 4) Measured displacement, **[in units of inches, mils (millimeters)]<Insert units of measure>**.
 - 5) Vibration level plot of vibration amplitude versus frequency for each measurement location.
 - 6) Verify vibration amplitude level plot versus frequency for each measurement location.
2. Verify actual vibration against vibration limits. Follow the[**General Machinery Vibration Severity Chart**] or[**Vibration Acceleration General Severity Chart**] from [ASHRAE Handbook - "HVAC Applications," Ch. "Noise and Vibration Control"] [NEBB's "Procedural Standard for Measurement of Sound and Vibration"] [or] [AABC's "National Standards for Total System Balance."] Acceptable levels of vibration are normally "smooth" to "good."
3. Include General Machinery Vibration Severity Chart with all conditions plotted.
4. Test each bearing on motor, pump, and compressor as required. Track and record vibration levels from rotating component through casing to base.
5. Include horizontal-vertical-axial measurements for tests.

3.15 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 1. Measure and record flows, temperatures, and pressures of each piece of equipment. Compare the values to design or nameplate information, where information is available.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the condition of filters.
 4. Check bearings and other lubricated parts for proper lubrication.
 5. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. TAB after Construction: Before performing testing and balancing of renovated existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished in accordance with renovation scope indicated by Contract Documents. Verify the following:
 1. New filters are installed.
 2. Bearings and other parts are properly lubricated.
 3. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 1. Compare the indicated system flows of the renovated work to the measured flows and determine the new pump speed.
 2. Verify that the indicated system flows of the renovated work result in velocities and pump speeds that are within the acceptable limits defined by equipment manufacturer.

3. If calculations increase or decrease the system flow rates by more than **[5]<Insert number>** percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is **[5]<Insert number>** percent or less, equipment adjustments are not required.

3.16 TOLERANCES

- A. Set plumbing system's flow rates within the following tolerances:
 1. Domestic Water Flow Rate: **[Plus or minus 5 percent][Plus or minus 10 percent][Plus 10 percent or minus 5 percent]<Insert value>**. If design value is less than **10 gpm (0.63 L/s)**, flow rate is within 10 percent.
 2. Compressed-Air Flow Rate: **[Plus or minus 5 percent][Plus or minus 10 percent][Plus 10 percent or minus 5 percent]<Insert value>**. If design value is less than **10 gpm (0.63 L/s)**, flow rate is within 10 percent.
 3. Vacuum Flow Rate: **[Plus or minus 5 percent][Plus or minus 10 percent][Plus 10 percent or minus 5 percent]<Insert value>**.

3.17 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to plumbing systems and general construction to allow access for performance-measuring and -balancing devices.
- B. Status Reports: Prepare **[weekly][biweekly][monthly]<Insert time interval>** progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.18 FINAL TESTING AND BALANCING REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Pump curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.

2. Name and address of the TAB specialist firm and technician.
 3. Project name.
 4. Project location.
 5. Project Architect's name, firm, and address.
 6. Project engineer's name, firm, and address.
 7. Project Contractor's name, firm, and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents, including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for pump performance forms, including the following:
 - a. Variable-frequency controller settings for variable-flow hydronic systems.
 - b. Settings for pressure controller(s).
 - c. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of distribution systems. Present each system with single-line diagram and include the following:
1. Flow rates.
 2. Pipe and valve sizes and locations.
 3. Balancing stations.
 4. Position of balancing devices.
- E. Gas- and Oil-Fired Water Heaters Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in **Btu/h (kW)**.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and speed.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in **inches (mm)**, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in **inches (mm)**.
 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in **cfm (L/s)**.
 - b. Entering-water temperature in **deg F (deg C)**.

- c. Leaving-water temperature in **deg F (deg C)**.
 - d. Low-fire fuel input in **Btu/h (kW)**.
 - e. High-fire fuel input in **Btu/h (kW)**.
 - f. High-temperature-limit setting in **deg F (deg C)**.
 - g. Operating set point in **Btu/h (kW)**.
 - h. Heating value of fuel in **Btu/h (kW)**.
- F. Electric Water Heater Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
 - 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Model number and unit size.
 - d. Manufacturer's serial number.
 - e. Output capacity in **Btu/h (kW)**.
 - f. Number of stages.
 - g. Connected volts, phase, and hertz.
 - h. Rated amperage.
 - 2. Test Data (Indicated and Actual Values):
 - a. Heat output in **Btu/h (kW)**.
 - b. Entering-water temperature in **deg F (deg C)**.
 - c. Leaving-water temperature in **deg F (deg C)**.
 - d. High-temperature-limit setting in **deg F (deg C)**.
 - e. Operating set point in **deg F (deg C)**.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- G. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in **gpm (L/s)**.
 - g. Water-pressure differential in **feet of head or psig (kPa)**.
 - h. Required net positive suction head in **feet of head or psig (kPa)**.
 - i. Pump speed.
 - j. Impeller diameter in **inches (mm)**.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 - 2. Test Data (Indicated and Actual Values):

- a. Static head in **feet of head or psig (kPa)**.
- b. Pump shutoff pressure in **feet of head or psig (kPa)**.
- c. Actual impeller size in **inches (mm)**.
- d. Full-open flow rate in **gpm (L/s)**.
- e. Full-open pressure in **feet of head or psig (kPa)**.
- f. Final discharge pressure in **feet of head or psig (kPa)**.
- g. Final suction pressure in **feet of head or psig (kPa)**.
- h. Final total pressure in **feet of head or psig (kPa)**.
- i. Final water flow rate in **gpm (L/s)**.
- j. Voltage at each connection.
- k. Amperage for each phase.

H. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.19 VERIFICATION OF TAB REPORT

- A. The TAB specialist firm's test and balance technician is to conduct the final verification in the presence of **[Architect][Owner][Construction Manager][Commissioning Authority]**.
- B. **[Architect][Owner][Construction Manager][Commissioning Authority]** are to randomly select measurements, documented in the final report, to be rechecked. Rechecking is to be limited to the lesser of either **[10]<Insert number>** percent of the total measurements recorded or the extent of measurements that can be accomplished in **[a normal 8-hour business day]<Insert value>**.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements are to be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than **[10][20]<Insert number>** percent of the total measurements checked during the final inspection, the TAB are to considered incomplete and are to be rejected.
- E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
 1. TAB specialists are to recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. Track all changes to show changes made to previous report.
 2. If the second final inspection also fails, Owner may pursue other Contract options to complete TAB Work.
- F. Prepare test and inspection reports.

3.20 REVERIFICATION

- A. TAB specialist firm technicians are to recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and request a second verification.



-
- B. If the second verification also fails, [Owner][Architect] may contact [AABC headquarters regarding the AABC National Performance Guaranty][TABB Quality Assurance Program, Customer Complaint Procedures]<Insert guaranty organization>.

3.21 ADDITIONAL TESTS

- A. Within [90]<Insert number> days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 22 05 00 00A



Task	Specification	Specification Description
22 05 13 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing
22 05 16 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing
22 05 17 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing
22 05 19 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 23 00 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.
2. Butterfly valves.
3. Check valves.
4. Gate valves.
5. Chainwheels.

1.2 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer.
- C. FKM: Fluoroelastomer.
- D. NBR: Nitrile butadiene rubber (also known as Buna-N).
- E. NRS: Nonrising stem.
- F. OS&Y: Outside screw and yoke.
- G. PTFE: Polytetrafluoroethylene.
- H. RPTFE: Reinforced polytetrafluoroethylene.
- I. RS: Rising stem.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include material descriptions and dimensions of individual components.
 - b. Include operating characteristics and furnished accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooved ends, press ends, solder ends, and weld ends.

3. Set ball valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.
5. Block check valves in either closed or open position.
6. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems or other components as lifting or rigging points unless specifically indicated for this purpose in manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic-water piping valves intended to convey or dispense water for human consumption must comply with the U.S. Safe Drinking Water Act (SDWA), requirements of authorities having jurisdiction, and NSF 61/NSF 372; or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder-joint connections.
6. ASME B16.22 for wrought-copper solder-joint connections.
7. ASME B16.34 for flanged- and threaded-end connections.
8. ASME B16.51 for press joint connections.
9. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.
- H. Valve Actuator Type:
 - 1. Gear Actuator: For quarter-turn ball valves **[NPS 4 (DN 100)]<Insert pipe size>** and larger.
 - 2. Hand Lever: For quarter-turn ball valves smaller than **[NPS 4 (DN 100)]<Insert pipe size>**.
- I. Valves in Insulated Piping:
 - 1. Provide **2-inch (50-mm)** extended neck stems.
 - 2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Provide memory stops that are fully adjustable after insulation is applied.

2.3 BALL VALVES, LEAD FREE

- A. Ball Valves, Lead Free, Threaded Ends - Brass, One Piece:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Bonomi North America, Inc.]**
 - b. **[KITZ Corporation]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Bonomi North America, Inc.]**
 - b. **[KITZ Corporation]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **<Insert manufacturer's name>**
 - 3. Standards: MSS SP-110 and MSS SP-145.
 - 4. CWP Rating: **400 psig (2760 kPa)**.
 - 5. Body Design: One piece.
 - 6. Body Material: Forged brass or bronze.
 - 7. Ends: Threaded.
 - 8. Seats: PTFE.
 - 9. Stem: Brass or stainless steel.
 - 10. Ball: Chrome-plated brass or stainless steel.
 - 11. Port: Reduced.
- B. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Bonomi North America, Inc.]
 - e. [Center Line; a Crane Co. brand]
 - f. [DynaQuip Controls]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jenkins Valves; a Crane Co. brand]
 - j. [Jomar Valve]
 - k. [KITZ Corporation]
 - l. [Lance Valves]
 - m. [Marwin Valve; Richards Industries]
 - n. [Milwaukee Valve Company]
 - o. [Mueller Streamline Co.; a company of Mueller Industries]
 - p. [Red-White Valve Corp.]
 - q. [Stockham; a Crane Co. brand]
 - r. [Viega LLC]
 - s. [WATTS; A Watts Water Technologies Company]
 - t. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Bonomi North America, Inc.]
 - e. [Center Line; a Crane Co. brand]
 - f. [DynaQuip Controls]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jenkins Valves; a Crane Co. brand]
 - j. [Jomar Valve]
 - k. [KITZ Corporation]
 - l. [Lance Valves]
 - m. [Marwin Valve; Richards Industries]
 - n. [Milwaukee Valve Company]
 - o. [Mueller Streamline Co.; a company of Mueller Industries]
 - p. [Red-White Valve Corp.]
 - q. [Stockham; a Crane Co. brand]
 - r. [Viega LLC]
 - s. [WATTS; A Watts Water Technologies Company]
 - t. <Insert manufacturer's name>
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Two piece.
6. Body Material: Forged brass.
7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Brass.
10. Ball: Chrome-plated brass.
11. Port: Full.

- C. Ball Valves, Lead Free, Press Ends - Brass, Two Piece with Full Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Bonomi North America, Inc.]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Hammond Valve]**
 - f. **[Jenkins Valves; a Crane Co. brand]**
 - g. **[Jomar Valve]**
 - h. **[KITZ Corporation]**
 - i. **[Lance Valves]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Stockham; a Crane Co. brand]**
 - l. **[Viega LLC]**
 - m. **[WATTS; A Watts Water Technologies Company]**
 - n. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Bonomi North America, Inc.]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Hammond Valve]**
 - f. **[Jenkins Valves; a Crane Co. brand]**
 - g. **[Jomar Valve]**
 - h. **[KITZ Corporation]**
 - i. **[Lance Valves]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Stockham; a Crane Co. brand]**
 - l. **[Viega LLC]**
 - m. **[WATTS; A Watts Water Technologies Company]**
 - n. **<Insert manufacturer's name>**
 3. Standards: MSS SP-110, MSS SP-145, IAPMO/ANSI Z1157.
 4. CWP Rating: Minimum **200 psig (1380 kPa)**.
 5. Body Design: Two piece.
 6. Body Material: Forged brass.
 7. Ends: Press.
 8. Press-End Connections Rating: Minimum **200 psig (1380 kPa)**.
 9. Seats: PTFE or RPTFE.
 10. Stem: Brass.
 11. Ball: Chrome-plated brass.
 12. Port: Full.
 13. O-Ring Seal: NBR or EPDM.
- D. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Stainless Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[American Valve, Inc]**
 - c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[KITZ Corporation]**
 - h. **[Lance Valves]**
 - i. **[Marwin Valve; Richards Industries]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Red-White Valve Corp.]**
 - l. **[Stockham; a Crane Co. brand]**
 - m. **[Viega LLC]**
 - n. **[WATTS; A Watts Water Technologies Company]**
 - o. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[American Valve, Inc]**
 - c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[KITZ Corporation]**
 - h. **[Lance Valves]**
 - i. **[Marwin Valve; Richards Industries]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Red-White Valve Corp.]**
 - l. **[Stockham; a Crane Co. brand]**
 - m. **[Viega LLC]**
 - n. **[WATTS; A Watts Water Technologies Company]**
 - o. **<Insert manufacturer's name>**

3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Two piece.
6. Body Material: Forged brass.
7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Full.

E. Ball Valves, Lead Free, Press Ends - Brass, Two Piece with Full Port and Stainless Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Valve, Inc]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [Hammond Valve]
 - e. [Jomar Valve]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [Viega LLC]
 - l. [WATTS; A Watts Water Technologies Company]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [American Valve, Inc]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [Hammond Valve]
 - e. [Jomar Valve]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [Viega LLC]
 - l. [WATTS; A Watts Water Technologies Company]
 - m. <Insert manufacturer's name>
3. Standards: MSS SP-110, MSS SP-145, and IAPMO/ANSI Z1157.
 4. CWP Rating: Minimum **200 psig (1380 kPa)**.
 5. Body Design: Two piece.
 6. Body Material: Forged brass.
 7. Ends: Press.
 8. Press-End Connections Rating: Minimum **200 psig (1380 kPa)**.
 9. Seats: PTFE or RPTFE.
 10. Stem: Stainless steel.
 11. Ball: Stainless steel, vented.
 12. Port: Full.
 13. O-Ring Seal: NBR or EPDM.
- F. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Two Piece with Regular Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]

- b. [American Valve, Inc]
- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- d. [Center Line; a Crane Co. brand]
- e. [FNW; Ferguson Enterprises, Inc.]
- f. [Hammond Valve]
- g. [Jomar Valve]
- h. [KITZ Corporation]
- i. [Lance Valves]
- j. [Milwaukee Valve Company]
- k. [Red-White Valve Corp.]
- l. [Stockham; a Crane Co. brand]
- m. [Viega LLC]
- n. [WATTS; A Watts Water Technologies Company]
- o. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [A.Y. McDonald Mfg. Co.]
- b. [American Valve, Inc]
- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- d. [Center Line; a Crane Co. brand]
- e. [FNW; Ferguson Enterprises, Inc.]
- f. [Hammond Valve]
- g. [Jomar Valve]
- h. [KITZ Corporation]
- i. [Lance Valves]
- j. [Milwaukee Valve Company]
- k. [Red-White Valve Corp.]
- l. [Stockham; a Crane Co. brand]
- m. [Viega LLC]
- n. [WATTS; A Watts Water Technologies Company]
- o. <Insert manufacturer's name>

- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Two piece.
- 6. Body Material: Forged brass.
- 7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
- 8. Seats: PTFE.
- 9. Stem: Brass.
- 10. Ball: Chrome-plated brass.
- 11. Port: Regular.

- G. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Two Piece with Regular Port and Stainless Steel Trim:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]

- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Center Line; a Crane Co. brand]
 - e. [Hammond Valve]
 - f. [Jomar Valve]
 - g. [KITZ Corporation]
 - h. [Lance Valves]
 - i. [Marwin Valve; Richards Industries]
 - j. [Milwaukee Valve Company]
 - k. [Neles Corporation]
 - l. [Red-White Valve Corp.]
 - m. [Stockham; a Crane Co. brand]
 - n. [Viega LLC]
 - o. [WATTS; A Watts Water Technologies Company]
 - p. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Center Line; a Crane Co. brand]
 - e. [Hammond Valve]
 - f. [Jomar Valve]
 - g. [KITZ Corporation]
 - h. [Lance Valves]
 - i. [Marwin Valve; Richards Industries]
 - j. [Milwaukee Valve Company]
 - k. [Neles Corporation]
 - l. [Red-White Valve Corp.]
 - m. [Stockham; a Crane Co. brand]
 - n. [Viega LLC]
 - o. [WATTS; A Watts Water Technologies Company]
 - p. <Insert manufacturer's name>
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Two piece.
6. Body Material: Brass or bronze.
7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Regular.
- H. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Three Piece with Full Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Bonomi North America, Inc.]
 - b. [Jomar Valve]
 - c. [Marwin Valve; Richards Industries]

- d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Bonomi North America, Inc.]**
 - b. **[Jomar Valve]**
 - c. **[Marwin Valve; Richards Industries]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Three piece.
- 6. Body Material: Forged brass.
- 7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
- 8. Seats: PTFE.
- 9. Stem: Brass.
- 10. Ball: Chrome-plated brass.
- 11. Port: Full.
- I. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Three Piece with Full Port and Stainless Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[DynaQuip Controls]**
 - b. **[Marwin Valve; Richards Industries]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DynaQuip Controls]**
 - b. **[Marwin Valve; Richards Industries]**
 - c. **<Insert manufacturer's name>**
 - 3. Standards: MSS SP-110 and MSS SP-145.
 - 4. CWP Rating: **600 psig (4140 kPa)**.
 - 5. Body Design: Three piece.
 - 6. Body Material: Forged brass.
 - 7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
 - 8. Seats: PTFE.
 - 9. Stem: Stainless steel.
 - 10. Ball: Stainless steel, vented.
 - 11. Port: Full.
- J. Ball Valves, Lead Free, Threaded Ends - Bronze, One Piece with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[NIBCO INC.]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[NIBCO INC.]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
 3. Standards: MSS SP-110 and MSS SP-145.
 4. CWP Rating: **400 psig (2760 kPa)**.
 5. Body Design: One piece.
 6. Body Material: Bronze.
 7. Ends: Threaded.
 8. Seats: PTFE.
 9. Stem: Bronze.
 10. Ball: Chrome-plated brass.
 11. Port: Reduced.
- K. Ball Valves, Lead Free, Threaded Ends - Bronze, One Piece with Stainless Steel Trim:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[NIBCO INC.]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[NIBCO INC.]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **<Insert manufacturer's name>**
 3. Standards: MSS SP-110 and MSS SP-145.
 4. CWP Rating: **600 psig (4140 kPa)**.
 5. Body Design: One piece.
 6. Body Material: Bronze.
 7. Ends: Threaded.
 8. Seats: PTFE.
 9. Stem: Stainless steel.
 10. Ball: Stainless steel, vented.

11. Port: Reduced.

L. Ball Valves, Lead Free, Threaded or Soldered Ends - Bronze, Two Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Bonomi North America, Inc.]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Milwaukee Valve Company]**
 - g. **[NIBCO INC.]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **[Viega LLC]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **[Zurn Industries, LLC]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Bonomi North America, Inc.]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Milwaukee Valve Company]**
 - g. **[NIBCO INC.]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **[Viega LLC]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **[Zurn Industries, LLC]**
 - m. **<Insert manufacturer's name>**
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Two piece.
6. Body Material: Bronze.
7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Bronze or brass.
10. Ball: Chrome-plated brass.
11. Port: Full.

M. Ball Valves, Lead Free, Press Ends - Bronze, Two Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Center Line; a Crane Co. brand]
- c. [Hammond Valve]
- d. [Milwaukee Valve Company]
- e. [NIBCO INC.]
- f. [Red-White Valve Corp.]
- g. [Stockham; a Crane Co. brand]
- h. [Viega LLC]
- i. [Zurn Industries, LLC]
- j. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Center Line; a Crane Co. brand]
- c. [Hammond Valve]
- d. [Milwaukee Valve Company]
- e. [NIBCO INC.]
- f. [Red-White Valve Corp.]
- g. [Stockham; a Crane Co. brand]
- h. [Viega LLC]
- i. [Zurn Industries, LLC]
- j. <Insert manufacturer's name>

3. Standards: MSS SP-110, MSS SP-145, and IAPMO/ANSI Z1157.
4. CWP Rating: Minimum **200 psig (1380 kPa)**.
5. Body Design: Two piece.
6. Body Material: Bronze.
7. Ends: Press.
8. Press-End Connections Rating: Minimum **200 psig (1380 kPa)**.
9. Seats: PTFE or RTPFE.
10. Stem: Bronze or brass.
11. Ball: Chrome-plated brass.
12. Port: Full.
13. O-Ring Seal: EPDM or NBR.

- N. Ball Valves, Lead Free, Threaded or Soldered Ends - Bronze, Two Piece with Full Port and Stainless Steel Trim:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Center Line; a Crane Co. brand]
- c. [DynaQuip Controls]
- d. [Hammond Valve]
- e. [Jenkins Valves; a Crane Co. brand]
- f. [Milwaukee Valve Company]

- g. [NIBCO INC.]
- h. [Red-White Valve Corp.]
- i. [Stockham; a Crane Co. brand]
- j. [Viega LLC]
- k. [WATTS; A Watts Water Technologies Company]
- l. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Center Line; a Crane Co. brand]
- c. [DynaQuip Controls]
- d. [Hammond Valve]
- e. [Jenkins Valves; a Crane Co. brand]
- f. [Milwaukee Valve Company]
- g. [NIBCO INC.]
- h. [Red-White Valve Corp.]
- i. [Stockham; a Crane Co. brand]
- j. [Viega LLC]
- k. [WATTS; A Watts Water Technologies Company]
- l. <Insert manufacturer's name>

- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Two piece.
- 6. Body Material: Bronze.
- 7. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
- 8. Seats: PTFE.
- 9. Stem: Stainless steel.
- 10. Ball: Stainless steel, vented.
- 11. Port: Full.

- O. Ball Valves, Lead Free, Threaded Ends - Bronze, Two Piece with Regular Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [American Valve, Inc]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Center Line; a Crane Co. brand]
- d. [DynaQuip Controls]
- e. [Hammond Valve]
- f. [Jenkins Valves; a Crane Co. brand]
- g. [Jomar Valve]
- h. [Lance Valves]
- i. [Milwaukee Valve Company]
- j. [NIBCO INC.]
- k. [Red-White Valve Corp.]
- l. [Stockham; a Crane Co. brand]
- m. [Viega LLC]

- n. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Valve, Inc]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [DynaQuip Controls]
 - e. [Hammond Valve]
 - f. [Jenkins Valves; a Crane Co. brand]
 - g. [Jomar Valve]
 - h. [Lance Valves]
 - i. [Milwaukee Valve Company]
 - j. [NIBCO INC.]
 - k. [Red-White Valve Corp.]
 - l. [Stockham; a Crane Co. brand]
 - m. [Viega LLC]
 - n. <Insert manufacturer's name>
- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Two piece.
- 6. Body Material: Bronze.
- 7. Ends: Threaded.
- 8. Seats: PTFE.
- 9. Stem: Bronze or brass.
- 10. Ball: Chrome-plated brass.
- 11. Port: Regular.
- P. Ball Valves, Lead Free, Threaded Ends - Bronze, Two Piece with Regular Port and Stainless Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Center Line; a Crane Co. brand]
 - c. [DynaQuip Controls]
 - d. [Hammond Valve]
 - e. [Jenkins Valves; a Crane Co. brand]
 - f. [Jomar Valve]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [Viega LLC]
 - l. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]

- b. [Center Line; a Crane Co. brand]
- c. [DynaQuip Controls]
- d. [Hammond Valve]
- e. [Jenkins Valves; a Crane Co. brand]
- f. [Jomar Valve]
- g. [Milwaukee Valve Company]
- h. [NIBCO INC.]
- i. [Red-White Valve Corp.]
- j. [Stockham; a Crane Co. brand]
- k. [Viega LLC]
- l. <Insert manufacturer's name>

- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Two piece.
- 6. Body Material: Bronze.
- 7. Ends: Threaded.
- 8. Seats: PTFE.
- 9. Stem: Stainless steel.
- 10. Ball: Stainless steel, vented.
- 11. Port: Regular.

Q. Ball Valves, Lead Free, Threaded Ends - Bronze, Three Piece with Full Port and Bronze or Brass Trim:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [WATTS; A Watts Water Technologies Company]
 - c. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert **manufacturer's name; product name or designation**> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [WATTS; A Watts Water Technologies Company]
 - c. <Insert manufacturer's name>
- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **600 psig (4140 kPa)**.
- 5. Body Design: Three piece.
- 6. Body Material: Bronze.
- 7. Ends: Threaded.
- 8. Seats: PTFE.
- 9. Stem: Bronze or brass.
- 10. Ball: Chrome-plated brass.
- 11. Port: Full.

R. Ball Valves, Lead Free, Threaded Ends - Bronze, Three Piece with Full Port and Stainless Steel Trim:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [DynaQuip Controls]
 - c. [NIBCO INC.]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [DynaQuip Controls]
 - c. [NIBCO INC.]
 - d. <Insert manufacturer's name>
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Three piece.
6. Body Material: Bronze.
7. Ends: Threaded.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Full.
- S. Ball Valves, Lead Free, Threaded or Soldered Ends - Bronze, Three Piece with Regular Port and Bronze or Brass Trim:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [NIBCO INC.]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [NIBCO INC.]
 - c. <Insert manufacturer's name>
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **600 psig (4140 kPa)**.
5. Body Design: Three piece.
6. Body Material: Bronze.
7. Ends: Threaded or soldered.
8. Seats: PTFE.
9. Stem: Bronze.
10. Ball: Chrome-plated brass.
11. Port: Regular.

- T. Ball Valves, Lead Free, Threaded or Soldered Ends - Bronze, Three Piece with Regular Port and Stainless Steel Trim:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[NIBCO INC.]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[NIBCO INC.]**
 - c. **<Insert manufacturer's name>**
 3. Standards: MSS SP-110 and MSS SP-145.
 4. CWP Rating: **600 psig (4140 kPa)**.
 5. Body Design: Three piece.
 6. Body Material: Bronze.
 7. Ends: Threaded or soldered.
 8. Seats: PTFE.
 9. Stem: Stainless steel.
 10. Ball: Stainless steel, vented.
 11. Port: Regular.
- U. Ball Valves, Lead Free, Flanged or Threaded Ends - Steel, with Full Port, Class 150:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jomar Valve]**
 - f. **[Lance Valves]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Neles Corporation]**
 - i. **[NIBCO INC.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[Viega LLC]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [DynaQuip Controls]
 - c. [FNW; Ferguson Enterprises, Inc.]
 - d. [Hammond Valve]
 - e. [Jomar Valve]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [Neles Corporation]
 - i. [NIBCO INC.]
 - j. [Stockham; a Crane Co. brand]
 - k. [Viega LLC]
 - l. [WATTS; A Watts Water Technologies Company]
 - m. <Insert manufacturer's name>
3. Standards: MSS SP-72 and MSS SP-110.
 4. CWP Rating: **285 psig (1964 kPa)**.
 5. Body Design: Split body.
 6. Body Material: Carbon steel, ASTM A216/A216M, Type WCB.
 7. Ends: Flanged or threaded. See Part 3 ball valve schedule articles.
 8. Seats: PTFE.
 9. Stem: Stainless steel.
 10. Ball: Stainless steel, vented.
 11. Port: Full.

V. Ball Valves, Lead Free, Flanged or Threaded Ends - Steel, with Regular Port, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [FNW; Ferguson Enterprises, Inc.]
 - c. [Hammond Valve]
 - d. [Jomar Valve]
 - e. [Lance Valves]
 - f. [Milwaukee Valve Company]
 - g. [Neles Corporation]
 - h. [NIBCO INC.]
 - i. [Stockham; a Crane Co. brand]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [FNW; Ferguson Enterprises, Inc.]
 - c. [Hammond Valve]
 - d. [Jomar Valve]
 - e. [Lance Valves]
 - f. [Milwaukee Valve Company]
 - g. [Neles Corporation]
 - h. [NIBCO INC.]
 - i. [Stockham; a Crane Co. brand]
 - j. <Insert manufacturer's name>

3. Standards: MSS SP-72 and MSS SP-110.
4. CWP Rating: **285 psig (1964 kPa)**.
5. Body Design: Uni-body.
6. Body Material: Carbon steel, ASTM A216/A216M, Type WCB.
7. Ends: Flanged or threaded. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Regular.

W. Ball Valves, Lead Free, Flanged or Threaded Ends - Iron, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
3. Standards: MSS SP-72, MSS SP-110, and MSS SP-145.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Split body.
6. Body Material: ASTM A126, gray iron.
7. Ends: Flanged or threaded. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel.
11. Port: Full.

X. Ball Valves, Lead Free, Threaded or Flanged Ends - Stainless Steel, Two Piece with Full Port:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Guardian Worldwide LLC.]**

- d. **[Jomar Valve]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Guardian Worldwide LLC.]**
 - d. **[Jomar Valve]**
 - e. **<Insert manufacturer's name>**
3. Standards: MSS SP-110 and MSS SP-145.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Split body.
6. Body Material: Type 316 stainless steel.
7. Ends: Threaded or flanged. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Type 316 stainless steel.
10. Ball: Type 316 stainless steel.
11. Port: Full.
- Y. Ball Valves, Lead Free, Press Ends - Stainless Steel, Two Piece with Full Port:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Jomar Valve]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Jomar Valve]**
 - d. **<Insert manufacturer's name>**
3. Standards: MSS SP-110, MSS SP-145, IAPMO PS-117, and ICC-ES LC1002.
4. CWP Rating: Minimum **200 psig (1380 kPa)**.
5. Body Design: Split body.
6. Body Material: Type 316 stainless steel.
7. Ends: Press.
8. Press-End Connections Rating: Minimum **200 psig (1380 kPa)**.
9. Seats: PTFE.
10. Stem: Type 316 stainless steel.
11. Ball: Type 316 stainless steel.
12. Port: Full.
13. O-Ring Seal: EPDM or NBR.

Z. Ball Valves - CPVC, Union Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[Colonial Engineering, Inc.]**
 - d. **[GF Piping Systems: Georg Fischer LLC]**
 - e. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - f. **[IPEX USA LLC]**
 - g. **[Jomar Valve]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Spears Manufacturing Company]**
 - j. **[Thermoplastic Valves, Inc]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[Colonial Engineering, Inc.]**
 - d. **[GF Piping Systems: Georg Fischer LLC]**
 - e. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - f. **[IPEX USA LLC]**
 - g. **[Jomar Valve]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Spears Manufacturing Company]**
 - j. **[Thermoplastic Valves, Inc]**
 - k. **<Insert manufacturer's name>**
3. Standard: MSS SP-122.
4. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 ball valve schedule articles.
5. Body Material: CPVC.
6. Body Design: Union type.
7. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded. See Part 3 ball valve schedule articles.
8. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Detachable, socket, socket or threaded, threaded, or flanged. See Part 3 ball valve schedule articles.
9. Ball: CPVC, full port.
10. Seals: PTFE or EPDM-rubber O-rings.
11. Handle: Tee shaped.

AA. Ball Valves - CPVC, Non-Union Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [IPEX USA LLC]
 - e. [Jomar Valve]
 - f. [Red-White Valve Corp.]
 - g. [Spears Manufacturing Company]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [IPEX USA LLC]
 - e. [Jomar Valve]
 - f. [Red-White Valve Corp.]
 - g. [Spears Manufacturing Company]
 - h. <Insert manufacturer's name>
3. Standard: MSS SP-122.
4. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)**. See Part 3 ball valve schedule articles.
5. Body Material: CPVC.
6. Body Design: Non-union type.
7. End Connections: Socket or threaded.
8. Ball: CPVC, full or reduced port.
9. Seals: PTFE or EPDM-rubber O-rings.
10. Handle: Tee shaped.

BB. Ball Valves - PVC, Union Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [GF Piping Systems: Georg Fischer LLC]
 - e. [Hayward Flow Control; Hayward Industries, Inc.]
 - f. [IPEX USA LLC]
 - g. [Jomar Valve]
 - h. [Red-White Valve Corp.]
 - i. [Spears Manufacturing Company]
 - j. [Thermoplastic Valves, Inc]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Valve, Inc]

- b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [GF Piping Systems: Georg Fischer LLC]
 - e. [Hayward Flow Control; Hayward Industries, Inc.]
 - f. [IPEX USA LLC]
 - g. [Jomar Valve]
 - h. [Red-White Valve Corp.]
 - i. [Spears Manufacturing Company]
 - j. [Thermoplastic Valves, Inc]
 - k. <Insert manufacturer's name>
3. Standard: MSS SP-122.
 4. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 ball valve schedule articles.
 5. Body Material: PVC.
 6. Body Design: Union type.
 7. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded. See Part 3 ball valve schedule articles.
 8. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Detachable union with socket, socket or threaded, threaded, or flanged. See Part 3 ball valve schedule articles.
 9. Ball: PVC, full port.
 10. Seals: PTFE or EPDM-rubber O-rings.
 11. Handle: Tee shaped.

CC. Ball Valves - PVC, Non-Union Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [IPEX USA LLC]
 - e. [Jomar Valve]
 - f. [Red-White Valve Corp.]
 - g. [Spears Manufacturing Company]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [Colonial Engineering, Inc.]
 - d. [IPEX USA LLC]
 - e. [Jomar Valve]
 - f. [Red-White Valve Corp.]
 - g. [Spears Manufacturing Company]
 - h. <Insert manufacturer's name>
3. Standard: MSS SP-122.
4. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure

- at 73 deg F (23 deg C) or other temperature.
- 5. Body Material: PVC.
- 6. Body Design: Non-union type.
- 7. End Connections: Socket or threaded.
- 8. Ball: PVC, full or reduced port.
- 9. Seals: PTFE or EPDM-rubber O-rings.
- 10. Handle: Tee shaped.

2.4 BALL VALVES, GENERAL PURPOSE

A. Ball Valves, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[American Valve, Inc]**
 - c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - d. **[Center Line; a Crane Co. brand]**
 - e. **[DynaQuip Controls]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Hammond Valve]**
 - h. **[Jenkins Valves; a Crane Co. brand]**
 - i. **[Jomar Valve]**
 - j. **[KITZ Corporation]**
 - k. **[Lance Valves]**
 - l. **[Legend Valve & Fitting, Inc]**
 - m. **[Marwin Valve; Richards Industries]**
 - n. **[Milwaukee Valve Company]**
 - o. **[Red-White Valve Corp.]**
 - p. **[Siemens Industry, Inc., Building Technologies Division]**
 - q. **[Stockham; a Crane Co. brand]**
 - r. **[Viega LLC]**
 - s. **[WATTS; A Watts Water Technologies Company]**
 - t. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[American Valve, Inc]**
 - c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - d. **[Center Line; a Crane Co. brand]**
 - e. **[DynaQuip Controls]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Hammond Valve]**
 - h. **[Jenkins Valves; a Crane Co. brand]**
 - i. **[Jomar Valve]**
 - j. **[KITZ Corporation]**
 - k. **[Lance Valves]**
 - l. **[Legend Valve & Fitting, Inc]**
 - m. **[Marwin Valve; Richards Industries]**

- n. [Milwaukee Valve Company]
- o. [Red-White Valve Corp.]
- p. [Siemens Industry, Inc., Building Technologies Division]
- q. [Stockham; a Crane Co. brand]
- r. [Viega LLC]
- s. [WATTS; A Watts Water Technologies Company]
- t. <Insert manufacturer's name>

- 3. Standard: MSS SP-110.
- 4. SWP Rating: **150 psig (1035 kPa)**.
- 5. CWP Rating: **600 psig (4140 kPa)**.
- 6. Body Design: Two piece.
- 7. Body Material: Forged brass.
- 8. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
- 9. Seats: PTFE.
- 10. Stem: Brass.
- 11. Ball: Chrome-plated brass.
- 12. Port: Full.

B. Ball Valves, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Stainless Steel Trim:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [DynaQuip Controls]
 - f. [FNW; Ferguson Enterprises, Inc.]
 - g. [Hammond Valve]
 - h. [Jamesbury; a brand of Valmet]
 - i. [Jenkins Valves; a Crane Co. brand]
 - j. [Jomar Valve]
 - k. [KITZ Corporation]
 - l. [Lance Valves]
 - m. [Legend Valve & Fitting, Inc]
 - n. [Marwin Valve; Richards Industries]
 - o. [Milwaukee Valve Company]
 - p. [Red-White Valve Corp.]
 - q. [RuB Inc]
 - r. [Siemens Industry, Inc., Building Technologies Division]
 - s. [Stockham; a Crane Co. brand]
 - t. [Viega LLC]
 - u. [WATTS; A Watts Water Technologies Company]
 - v. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]

- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [DynaQuip Controls]
 - f. [FNW; Ferguson Enterprises, Inc.]
 - g. [Hammond Valve]
 - h. [Jamesbury; a brand of Valmet]
 - i. [Jenkins Valves; a Crane Co. brand]
 - j. [Jomar Valve]
 - k. [KITZ Corporation]
 - l. [Lance Valves]
 - m. [Legend Valve & Fitting, Inc]
 - n. [Marwin Valve; Richards Industries]
 - o. [Milwaukee Valve Company]
 - p. [Red-White Valve Corp.]
 - q. [RuB Inc]
 - r. [Siemens Industry, Inc., Building Technologies Division]
 - s. [Stockham; a Crane Co. brand]
 - t. [Viega LLC]
 - u. [WATTS; A Watts Water Technologies Company]
 - v. <Insert manufacturer's name>
- 3. Standard: MSS SP-110.
 - 4. SWP Rating: **150 psig (1035 kPa)**.
 - 5. CWP Rating: **600 psig (4140 kPa)**.
 - 6. Body Design: Two piece.
 - 7. Body Material: Forged brass.
 - 8. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
 - 9. Seats: PTFE.
 - 10. Stem: Stainless steel.
 - 11. Ball: Stainless steel, vented.
 - 12. Port: Full.
- C. Ball Valves, Threaded or Soldered Ends - Brass, Three Piece with Full Port and Brass Trim:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [WATTS; A Watts Water Technologies Company]
 - b. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert **manufacturer's name; product name or designation**> or comparable product by one of the following:
 - a. [WATTS; A Watts Water Technologies Company]
 - b. <Insert manufacturer's name>
 - 3. Standard: MSS SP-110.
 - 4. SWP Rating: **150 psig (1035 kPa)**.
 - 5. CWP Rating: **600 psig (4140 kPa)**.
 - 6. Body Design: Three piece.
 - 7. Body Material: Forged brass.
 - 8. Ends: Threaded or soldered ends. See Part 3 ball valve schedule articles.
 - 9. Seats: PTFE.

10. Stem: Brass.
11. Ball: Chrome-plated brass.
12. Port: Full.

D. Ball Valves, Threaded or Soldered Ends - Brass, Three Piece with Full Port and Stainless Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[DynaQuip Controls]**
 - b. **[Marwin Valve; Richards Industries]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DynaQuip Controls]**
 - b. **[Marwin Valve; Richards Industries]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **<Insert manufacturer's name>**
3. Standard: MSS SP-110.
4. SWP Rating: **150 psig (1035 kPa)**.
5. CWP Rating: **600 psig (4140 kPa)**.
6. Body Design: Three piece.
7. Body Material: Forged brass.
8. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
9. Seats: PTFE.
10. Stem: Stainless steel.
11. Ball: Stainless steel, vented.
12. Port: Full.

E. Ball Valves, Threaded Ends - Bronze, Two Piece, Safety Exhaust:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[Lance Valves]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[Lance Valves]**

- d. <Insert manufacturer's name>
- 3. Standards: MSS SP-110 and MSS SP-145.
- 4. CWP Rating: **200 psig (1380 kPa)** or other pressure. See Part 3 ball valve schedule articles.
- 5. Body Design: Two piece.
- 6. Body Material: Bronze, ASTM B584, Alloy C844.
- 7. Ends: Threaded.
- 8. Seats: PTFE.
- 9. Stem: Stainless steel.
- 10. Ball: Chrome-plated brass, with exhaust vent opening for pneumatic applications.
- 11. Port: Full.
- F. Ball Valves, Flanged Ends - Steel, with Full Port and Stainless Steel Trim, Class 150:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jamesbury; a brand of Valmet]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[Viega LLC]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jamesbury; a brand of Valmet]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[Viega LLC]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. <Insert manufacturer's name>
 - 3. Standard: MSS SP-72.
 - 4. CWP Rating: **285 psig (1964 kPa)**.
 - 5. Body Design: Split body.
 - 6. Body Material: Carbon steel, ASTM A216/A216M, Type WCB.
 - 7. Ends: Flanged.

8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Full.

G. Ball Valves, Flanged Ends - Steel, with Full Port and Stainless Steel Trim, Class 300:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jamesbury; a brand of Valmet]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[Viega LLC]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[DynaQuip Controls]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jamesbury; a brand of Valmet]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[Viega LLC]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. **<Insert manufacturer's name>**
3. Standard: MSS SP-72.
4. CWP Rating: **720 psig (4960 kPa)**.
5. Body Design: Split body.
6. Body Material: Carbon steel, ASTM A216/A216M, Type WCB.
7. Ends: Flanged.
8. Seats: PTFE.
9. Stem: Stainless steel.
10. Ball: Stainless steel, vented.
11. Port: Full.

H. Ball Valves, Flanged Ends - Iron, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
 3. Standard: MSS SP-72.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Design: Split body.
 6. Body Material: ASTM A126, gray iron.
 7. Ends: Flanged.
 8. Seats: PTFE.
 9. Stem: Stainless steel.
 10. Ball: Stainless steel.
 11. Port: Full.
- I. Ball Valves, Threaded or Flanged Ends - Stainless Steel, Two Piece with Full Port:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jomar Valve]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jomar Valve]**
 - f. **<Insert manufacturer's name>**

3. Standard: MSS SP-110.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Split body.
6. Body Material: Type 316 stainless steel.
7. Ends: Threaded or flanged. See Part 3 ball valve schedule articles.
8. Seats: PTFE.
9. Stem: Type 316 stainless steel.
10. Ball: Type 316 stainless steel.
11. Port: Full.

2.5 BUTTERFLY VALVES, LEAD FREE

A. Butterfly Valves, Lead Free, Single Flange (Lug Type) - Iron, with Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**
 - q. **[NIBCO INC.]**
 - r. **[Norriseal]**
 - s. **[Red-White Valve Corp.]**
 - t. **[Stockham; a Crane Co. brand]**
 - u. **[Sure Flow Equipment Inc]**
 - v. **[Viega LLC]**
 - w. **[WATTS; A Watts Water Technologies Company]**
 - x. **[Zurn Industries, LLC]**
 - y. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**

- f. [Flo Fab Inc]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
- 3. Standard: MSS SP-67, Type I.
 - 4. CWP Rating: **150 psig (1035 kPa)**, or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
 - 5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
 - 7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
 - 8. Stem: One- or two-piece stainless steel.
 - 9. Disc: Aluminum bronze.
- B. Butterfly Valves, Lead Free, Single Flange (Lug Type) - Iron, with Ductile-Iron Disc:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [DeZURIK]
 - e. [DynaQuip Controls]
 - f. [Flo Fab Inc]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]

- s. [Red-White Valve Corp.]
- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ABZ Valve; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Center Line; a Crane Co. brand]
- d. [DeZURIK]
- e. [DynaQuip Controls]
- f. [Flo Fab Inc]
- g. [FNW; Ferguson Enterprises, Inc.]
- h. [Hammond Valve]
- i. [Jamesbury; a brand of Valmet]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Legend Valve & Fitting, Inc]
- p. [Milwaukee Valve Company]
- q. [NIBCO INC.]
- r. [Norriseal]
- s. [Red-White Valve Corp.]
- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

3. Standard: MSS SP-67, Type I.
4. CWP Rating: **150 psig (1035 kPa)**, or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
8. Stem: One- or two-piece stainless steel.
9. Disc: Nickel-plated[**or -coated**] ductile iron.

C. Butterfly Valves, Lead Free, Single Flange (Lug Type) - Iron, with Stainless Steel Disc:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]
 - m. [Kennedy Valve Company; a division of McWane, Inc.]
 - n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [NIBCO INC.]
 - s. [Norriseal]
 - t. [Red-White Valve Corp.]
 - u. [Stockham; a Crane Co. brand]
 - v. [Sure Flow Equipment Inc]
 - w. [Viega LLC]
 - x. [WATTS; A Watts Water Technologies Company]
 - y. [Zurn Industries, LLC]
 - z. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]
 - m. [Kennedy Valve Company; a division of McWane, Inc.]
 - n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [NIBCO INC.]
 - s. [Norriseal]
 - t. [Red-White Valve Corp.]
 - u. [Stockham; a Crane Co. brand]
 - v. [Sure Flow Equipment Inc]
 - w. [Viega LLC]
 - x. [WATTS; A Watts Water Technologies Company]
 - y. [Zurn Industries, LLC]

z. <Insert manufacturer's name>

3. Standard: MSS SP-67, Type I.
4. CWP Rating, NPS 12 (DN 300) and Smaller: **150 psig (1035 kPa) or 200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
8. Stem: One- or two-piece stainless steel.
9. Disc: Stainless steel.

D. Butterfly Valves, Lead Free, Flangeless (Wafer Type) - Iron, with Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**
 - q. **[NIBCO INC.]**
 - r. **[Norriseal]**
 - s. **[Red-White Valve Corp.]**
 - t. **[Stockham; a Crane Co. brand]**
 - u. **[Sure Flow Equipment Inc]**
 - v. **[Viega LLC]**
 - w. **[WATTS; A Watts Water Technologies Company]**
 - x. **[Zurn Industries, LLC]**
 - y. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**

- g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
- 3. Standard: MSS SP-67, Type I.
 - 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
 - 5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
 - 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
 - 7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
 - 8. Stem: One- or two-piece stainless steel.
 - 9. Disc: Aluminum bronze.
- E. Butterfly Valves, Lead Free, Flangeless (Wafer Type) - Iron, with Ductile-Iron Disc:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [DeZURIK]
 - e. [DynaQuip Controls]
 - f. [Flo Fab Inc]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]

- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ABZ Valve; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Center Line; a Crane Co. brand]
- d. [DeZURIK]
- e. [DynaQuip Controls]
- f. [Flo Fab Inc]
- g. [FNW; Ferguson Enterprises, Inc.]
- h. [Hammond Valve]
- i. [Jamesbury; a brand of Valmet]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Legend Valve & Fitting, Inc]
- p. [Milwaukee Valve Company]
- q. [NIBCO INC.]
- r. [Norriseal]
- s. [Red-White Valve Corp.]
- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

- 3. Standard: MSS SP-67, Type I.
- 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
- 5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
- 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
- 7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
- 8. Stem: One- or two-piece stainless steel.
- 9. Disc: Nickel-plated[**or -coated**] ductile iron.

F. Butterfly Valves, Lead Free, Flangeless (Wafer Type) - Iron, with Stainless Steel Disc:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ABZ Valve; an ASC Engineered Solution]

- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Center Line; a Crane Co. brand]
- e. [DeZURIK]
- f. [DynaQuip Controls]
- g. [Flo Fab Inc]
- h. [FNW; Ferguson Enterprises, Inc.]
- i. [Hammond Valve]
- j. [Jamesbury; a brand of Valmet]
- k. [Jenkins Valves; a Crane Co. brand]
- l. [Jomar Valve]
- m. [Kennedy Valve Company; a division of McWane, Inc.]
- n. [KITZ Corporation]
- o. [Lance Valves]
- p. [Legend Valve & Fitting, Inc]
- q. [Milwaukee Valve Company]
- r. [NIBCO INC.]
- s. [Norriseal]
- t. [Red-White Valve Corp.]
- u. [Stockham; a Crane Co. brand]
- v. [Sure Flow Equipment Inc]
- w. [Viega LLC]
- x. [WATTS; A Watts Water Technologies Company]
- y. [Zurn Industries, LLC]
- z. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ABZ Valve; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Center Line; a Crane Co. brand]
- e. [DeZURIK]
- f. [DynaQuip Controls]
- g. [Flo Fab Inc]
- h. [FNW; Ferguson Enterprises, Inc.]
- i. [Hammond Valve]
- j. [Jamesbury; a brand of Valmet]
- k. [Jenkins Valves; a Crane Co. brand]
- l. [Jomar Valve]
- m. [Kennedy Valve Company; a division of McWane, Inc.]
- n. [KITZ Corporation]
- o. [Lance Valves]
- p. [Legend Valve & Fitting, Inc]
- q. [Milwaukee Valve Company]
- r. [NIBCO INC.]
- s. [Norriseal]
- t. [Red-White Valve Corp.]
- u. [Stockham; a Crane Co. brand]
- v. [Sure Flow Equipment Inc]
- w. [Viega LLC]
- x. [WATTS; A Watts Water Technologies Company]
- y. [Zurn Industries, LLC]
- z. <Insert manufacturer's name>

3. Standard: MSS SP-67, Type I.
4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
7. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
8. Stem: One- or two-piece stainless steel.
9. Disc: Stainless steel.

G. Butterfly Valves, Lead Free, Grooved End - Ductile Iron, 175 CWP:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Hammond Valve]**
 - c. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - d. **[NIBCO INC.]**
 - e. **[Norriseal]**
 - f. **[Red-White Valve Corp.]**
 - g. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - h. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - i. **[Victaulic Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Hammond Valve]**
 - c. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - d. **[NIBCO INC.]**
 - e. **[Norriseal]**
 - f. **[Red-White Valve Corp.]**
 - g. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - h. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - i. **[Victaulic Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
3. Standard: MSS SP-67, Type I.
4. CWP Rating: **175 psig (1200 kPa)**.
5. Body Material: Coated, ductile iron.
6. Ends: Grooved.
7. Stem: Two-piece stainless steel.
8. Disc: Coated, ductile iron.
9. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.

H. Butterfly Valves, Lead Free, Grooved End - Ductile Iron, 300 CWP:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[ASC Engineered Solutions]**
 - d. **[Hammond Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[NIBCO INC.]**
 - g. **[Norriseal]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[Victaulic Company]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[ASC Engineered Solutions]**
 - d. **[Hammond Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[NIBCO INC.]**
 - g. **[Norriseal]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[Victaulic Company]**
 - l. **[WATTS; A Watts Water Technologies Company]**
 - m. **<Insert manufacturer's name>**
3. Standard: MSS SP-67, Type I.
4. CWP Rating, NPS 8 (DN 200) and Smaller: **300 psig (2070 kPa)**.
5. Body Material: Coated, ductile iron.
6. Ends: Grooved.
7. Stem: Two-piece stainless steel.
8. Disc: Coated, ductile iron.
9. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.

I. Butterfly Valves, Lead Free, Grooved End - Stainless Steel:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Anvil; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
- e. [Victaulic Company]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
- e. [Victaulic Company]
- f. <Insert manufacturer's name>

- 3. Standard: MSS SP-67, Type I.
- 4. CWP Rating, NPS 8 (DN 200) and Smaller: **300 psig (2070 kPa)**.
- 5. CWP Rating, NPS 10 (DN 250) and Larger: **200 psig (1380 kPa)**.
- 6. Body Material: Type 316 stainless steel, ASTM A743/A743M.
- 7. Ends: Grooved.
- 8. Stem: Type 416 stainless steel.
- 9. Disc: Type 316 stainless steel or ductile iron, encapsulated with Grade "EN" EPDM.
- 10. Seat: EPDM.

J. Butterfly Valves - CPVC:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Valve, Inc]
- b. [Colonial Engineering, Inc.]
- c. [GF Piping Systems: Georg Fischer LLC]
- d. [Hayward Flow Control; Hayward Industries, Inc.]
- e. [NIBCO INC.]
- f. [Spears Manufacturing Company]
- g. [Thermoplastic Valves, Inc]
- h. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [American Valve, Inc]
- b. [Colonial Engineering, Inc.]
- c. [GF Piping Systems: Georg Fischer LLC]
- d. [Hayward Flow Control; Hayward Industries, Inc.]
- e. [NIBCO INC.]
- f. [Spears Manufacturing Company]
- g. [Thermoplastic Valves, Inc]
- h. <Insert manufacturer's name>

3. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 butterfly valve schedule articles.
4. Body Material: CPVC.
5. Body Design: Flangeless (wafer) type.
6. Seat: EPDM rubber.
7. Seals: PTFE or EPDM-rubber O-rings.
8. Disc: CPVC.
9. Stem: Stainless steel.
10. Handle: Lever.

K. Butterfly Valves - PVC:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[ASC Engineered Solutions]**
 - d. **[Colonial Engineering, Inc.]**
 - e. **[GF Piping Systems: Georg Fischer LLC]**
 - f. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - g. **[IPEX USA LLC]**
 - h. **[Legend Valve & Fitting, Inc]**
 - i. **[NIBCO INC.]**
 - j. **[Spears Manufacturing Company]**
 - k. **[Thermoplastic Valves, Inc]**
 - l. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[ASC Engineered Solutions]**
 - d. **[Colonial Engineering, Inc.]**
 - e. **[GF Piping Systems: Georg Fischer LLC]**
 - f. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - g. **[IPEX USA LLC]**
 - h. **[Legend Valve & Fitting, Inc]**
 - i. **[NIBCO INC.]**
 - j. **[Spears Manufacturing Company]**
 - k. **[Thermoplastic Valves, Inc]**
 - l. **<Insert manufacturer's name>**
3. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 butterfly valve schedule articles.
4. Body Material: PVC.
5. Body Design: Flangeless (wafer) type.
6. Seat: EPDM rubber.
7. Seals: PTFE or EPDM-rubber O-rings.
8. Disc: PVC.
9. Stem: Stainless steel.
10. Handle: Lever.

2.6 BUTTERFLY VALVES, GENERAL PURPOSE**A. Butterfly Valves, Single Flange (Lug Type) - Iron, with Aluminum-Bronze Disc:**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**
 - q. **[NIBCO INC.]**
 - r. **[Norriseal]**
 - s. **[Red-White Valve Corp.]**
 - t. **[Stockham; a Crane Co. brand]**
 - u. **[Sure Flow Equipment Inc]**
 - v. **[Viega LLC]**
 - w. **[WATTS; A Watts Water Technologies Company]**
 - x. **[Zurn Industries, LLC]**
 - y. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**

- q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
3. Standard: MSS SP-67, Type I.
 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
 5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
 7. Seat: NBR.
 8. Stem: One- or two-piece stainless steel.
 9. Disc: Aluminum bronze.
- B. Butterfly Valves, Single Flange (Lug Type) - Iron, with Ductile-Iron Disc:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [DeZURIK]
 - e. [DynaQuip Controls]
 - f. [Flo Fab Inc]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [ABZ Valve; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Center Line; a Crane Co. brand]
- d. [DeZURIK]
- e. [DynaQuip Controls]
- f. [Flo Fab Inc]
- g. [FNW; Ferguson Enterprises, Inc.]
- h. [Hammond Valve]
- i. [Jamesbury; a brand of Valmet]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Legend Valve & Fitting, Inc]
- p. [Milwaukee Valve Company]
- q. [NIBCO INC.]
- r. [Norriseal]
- s. [Red-White Valve Corp.]
- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

- 3. Standard: MSS SP-67, Type I.
- 4. CWP Rating: **150 psig (1035 kPa) or 200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
- 5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
- 7. Seat: NBR.
- 8. Stem: One- or two-piece stainless steel.
- 9. Disc: Nickel-plated[**or -coated**] ductile iron.

C. Butterfly Valves, Single Flange (Lug Type) - Iron, with Stainless Steel Disc:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]

- m. [Kennedy Valve Company; a division of McWane, Inc.]
 - n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [NIBCO INC.]
 - s. [Norriseal]
 - t. [Red-White Valve Corp.]
 - u. [Stockham; a Crane Co. brand]
 - v. [Sure Flow Equipment Inc]
 - w. [Viega LLC]
 - x. [WATTS; A Watts Water Technologies Company]
 - y. [Zurn Industries, LLC]
 - z. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]
 - m. [Kennedy Valve Company; a division of McWane, Inc.]
 - n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [NIBCO INC.]
 - s. [Norriseal]
 - t. [Red-White Valve Corp.]
 - u. [Stockham; a Crane Co. brand]
 - v. [Sure Flow Equipment Inc]
 - w. [Viega LLC]
 - x. [WATTS; A Watts Water Technologies Company]
 - y. [Zurn Industries, LLC]
 - z. <Insert manufacturer's name>
3. Standard: MSS SP-67, Type I.
4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
5. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
7. Seat: NBR.
8. Stem: One- or two-piece stainless steel.
9. Disc: Stainless steel.

D. Butterfly Valves, Flangeless (Wafer Type) - Iron, with Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**
 - q. **[NIBCO INC.]**
 - r. **[Norriseal]**
 - s. **[Red-White Valve Corp.]**
 - t. **[Stockham; a Crane Co. brand]**
 - u. **[Sure Flow Equipment Inc]**
 - v. **[Viega LLC]**
 - w. **[WATTS; A Watts Water Technologies Company]**
 - x. **[Zurn Industries, LLC]**
 - y. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Center Line; a Crane Co. brand]**
 - d. **[DeZURIK]**
 - e. **[DynaQuip Controls]**
 - f. **[Flo Fab Inc]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[Hammond Valve]**
 - i. **[Jamesbury; a brand of Valmet]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**
 - l. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - m. **[KITZ Corporation]**
 - n. **[Lance Valves]**
 - o. **[Legend Valve & Fitting, Inc]**
 - p. **[Milwaukee Valve Company]**
 - q. **[NIBCO INC.]**
 - r. **[Norriseal]**

- s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
3. Standard: MSS SP-67, Type I.
 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
 5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
 7. Seat: NBR.
 8. Stem: One- or two-piece stainless steel.
 9. Disc: Aluminum bronze.
- E. Butterfly Valves, Flangeless (Wafer Type) - Iron, with Ductile-Iron Disc:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Center Line; a Crane Co. brand]
 - d. [DeZURIK]
 - e. [DynaQuip Controls]
 - f. [Flo Fab Inc]
 - g. [FNW; Ferguson Enterprises, Inc.]
 - h. [Hammond Valve]
 - i. [Jamesbury; a brand of Valmet]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Legend Valve & Fitting, Inc]
 - p. [Milwaukee Valve Company]
 - q. [NIBCO INC.]
 - r. [Norriseal]
 - s. [Red-White Valve Corp.]
 - t. [Stockham; a Crane Co. brand]
 - u. [Sure Flow Equipment Inc]
 - v. [Viega LLC]
 - w. [WATTS; A Watts Water Technologies Company]
 - x. [Zurn Industries, LLC]
 - y. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ABZ Valve; an ASC Engineered Solution]

- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Center Line; a Crane Co. brand]
- d. [DeZURIK]
- e. [DynaQuip Controls]
- f. [Flo Fab Inc]
- g. [FNW; Ferguson Enterprises, Inc.]
- h. [Hammond Valve]
- i. [Jamesbury; a brand of Valmet]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Legend Valve & Fitting, Inc]
- p. [Milwaukee Valve Company]
- q. [NIBCO INC.]
- r. [Norriseal]
- s. [Red-White Valve Corp.]
- t. [Stockham; a Crane Co. brand]
- u. [Sure Flow Equipment Inc]
- v. [Viega LLC]
- w. [WATTS; A Watts Water Technologies Company]
- x. [Zurn Industries, LLC]
- y. <Insert manufacturer's name>

- 3. Standard: MSS SP-67, Type I.
- 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
- 5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
- 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
- 7. Seat: NBR.
- 8. Stem: One- or two-piece stainless steel.
- 9. Disc: Nickel-plated[**or -coated**] ductile iron.

F. Butterfly Valves, Flangeless (Wafer Type) - Iron, with Stainless Steel Disc:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]
 - m. [Kennedy Valve Company; a division of McWane, Inc.]

- n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - s. [NIBCO INC.]
 - t. [Norriseal]
 - u. [Red-White Valve Corp.]
 - v. [Stockham; a Crane Co. brand]
 - w. [Sure Flow Equipment Inc]
 - x. [Viega LLC]
 - y. [WATTS; A Watts Water Technologies Company]
 - z. [Zurn Industries, LLC]
 - aa. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Center Line; a Crane Co. brand]
 - e. [DeZURIK]
 - f. [DynaQuip Controls]
 - g. [Flo Fab Inc]
 - h. [FNW; Ferguson Enterprises, Inc.]
 - i. [Hammond Valve]
 - j. [Jamesbury; a brand of Valmet]
 - k. [Jenkins Valves; a Crane Co. brand]
 - l. [Jomar Valve]
 - m. [Kennedy Valve Company; a division of McWane, Inc.]
 - n. [KITZ Corporation]
 - o. [Lance Valves]
 - p. [Legend Valve & Fitting, Inc]
 - q. [Milwaukee Valve Company]
 - r. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - s. [NIBCO INC.]
 - t. [Norriseal]
 - u. [Red-White Valve Corp.]
 - v. [Stockham; a Crane Co. brand]
 - w. [Sure Flow Equipment Inc]
 - x. [Viega LLC]
 - y. [WATTS; A Watts Water Technologies Company]
 - z. [Zurn Industries, LLC]
 - aa. <Insert manufacturer's name>
- 3. Standard: MSS SP-67, Type I.
 - 4. CWP Rating: **150 psig (1035 kPa)** or **200 psig (1380 kPa)**. See Part 3 butterfly valve schedule articles.
 - 5. Body Design: Flangeless (wafer type), suitable for bidirectional dead-end service at rated pressure.
 - 6. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
 - 7. Seat: NBR.
 - 8. Stem: One- or two-piece stainless steel.
 - 9. Disc: Stainless steel.

G. Butterfly Valves, Grooved End - Ductile Iron, 175 CWP:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Grinnell G-Fire; brand of Johnson Controls International plc, Building Solutions North America]**
 - d. **[Hammond Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[NIBCO INC.]**
 - g. **[Norriseal]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[Victaulic Company]**
 - l. **[Zurn Industries, LLC]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Grinnell G-Fire; brand of Johnson Controls International plc, Building Solutions North America]**
 - d. **[Hammond Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[NIBCO INC.]**
 - g. **[Norriseal]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[Victaulic Company]**
 - l. **[Zurn Industries, LLC]**
 - m. **<Insert manufacturer's name>**
3. Standard: MSS SP-67, Type I.
4. CWP Rating: **175 psig (1200 kPa)**.
5. Body Material: Coated, ductile iron.
6. Ends: Grooved.
7. Stem: Two-piece stainless steel.
8. Disc: Coated, ductile iron.
9. Seat: NBR.

H. Butterfly Valves, Grooved End - Ductile Iron, 300 CWP:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Anvil; an ASC Engineered Solution]
 - b. [Grinnell G-Fire; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Hammond Valve]
 - d. [Kennedy Valve Company; a division of McWane, Inc.]
 - e. [NIBCO INC.]
 - f. [Norriseal]
 - g. [Red-White Valve Corp.]
 - h. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - i. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - j. [Victaulic Company]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Anvil; an ASC Engineered Solution]
 - b. [Grinnell G-Fire; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Hammond Valve]
 - d. [Kennedy Valve Company; a division of McWane, Inc.]
 - e. [NIBCO INC.]
 - f. [Norriseal]
 - g. [Red-White Valve Corp.]
 - h. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - i. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - j. [Victaulic Company]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
3. Standard: MSS SP-67, Type I.
4. CWP Rating, NPS 8 (DN 200) and Smaller: **300 psig (2070 kPa)**.
5. Body Material: Coated, ductile iron
6. Ends: Grooved.
7. Stem: Two-piece stainless steel.
8. Disc: Coated, ductile iron.
9. Seat: NBR.
- I. Butterfly Valves, Grooved End - Stainless Steel:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]

- e. [Victaulic Company]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
3. Standard: MSS SP-67, Type I.
4. CWP Rating, NPS 8 (DN 200) and Smaller: **300 psig (2070 kPa)**.
5. Body Material: Type 316 stainless steel, ASTM A743/A743M.
6. Ends: Grooved.
7. Stem: Type 416 stainless steel.
8. Disc: Type 316 stainless steel.
9. Seat: NBR.

2.7 CHECK VALVES, LEAD FREE

- A. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - k. [Stockham; a Crane Co. brand]
 - l. [Val-Matic Valve & Manufacturing Corp.]
 - m. [Victaulic Company]
 - n. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]

- d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - k. [Stockham; a Crane Co. brand]
 - l. [Val-Matic Valve & Manufacturing Corp.]
 - m. [Vicalic Company]
 - n. <Insert manufacturer's name>
- 3. Standard: MSS SP-80, Type 3.
 - 4. CWP Rating: **200 psig (1380 kPa)**.
 - 5. Body Design: Horizontal flow.
 - 6. Body Material: ASTM B62, bronze.
 - 7. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
 - 8. Disc: Bronze.
- B. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc, Class 125:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Powell Valves]
 - j. [Red-White Valve Corp.]
 - k. [Stockham; a Crane Co. brand]
 - l. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Powell Valves]
 - j. [Red-White Valve Corp.]
 - k. [Stockham; a Crane Co. brand]
 - l. <Insert manufacturer's name>

3. Standard: MSS SP-80, Type 4.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Horizontal flow.
6. Body Material: ASTM B62, bronze.
7. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
8. Disc: PTFE.

C. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Powell Valves]**
 - k. **[Red-White Valve Corp.]**
 - l. **[Stockham; a Crane Co. brand]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[NIBCO INC.]**
 - j. **[Powell Valves]**
 - k. **[Red-White Valve Corp.]**
 - l. **[Stockham; a Crane Co. brand]**
 - m. **<Insert manufacturer's name>**
3. Standard: MSS SP-80, Type 3.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Design: Horizontal flow.
6. Body Material: ASTM B62, bronze.
7. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
8. Disc: Bronze.

D. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc,

Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Crane Fluid Systems; Crane Co.]**
 - b. **[FNW; Ferguson Enterprises, Inc.]**
 - c. **[Jenkins Valves; a Crane Co. brand]**
 - d. **[Jomar Valve]**
 - e. **[Lance Valves]**
 - f. **[Milwaukee Valve Company]**
 - g. **[NIBCO INC.]**
 - h. **[Powell Valves]**
 - i. **[Red-White Valve Corp.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crane Fluid Systems; Crane Co.]**
 - b. **[FNW; Ferguson Enterprises, Inc.]**
 - c. **[Jenkins Valves; a Crane Co. brand]**
 - d. **[Jomar Valve]**
 - e. **[Lance Valves]**
 - f. **[Milwaukee Valve Company]**
 - g. **[NIBCO INC.]**
 - h. **[Powell Valves]**
 - i. **[Red-White Valve Corp.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **<Insert manufacturer's name>**
3. Standard: MSS SP-80, Type 4.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Design: Horizontal flow.
6. Body Material: ASTM B62, bronze.
7. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
8. Disc: PTFE.

E. Check Valves, Lead Free, Swing Type, Press Ends - Bronze:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
 - d. **[Hammond Valve]**
 - e. **[Milwaukee Valve Company]**
 - f. **[NIBCO INC.]**
 - g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
- d. [Hammond Valve]
- e. [Milwaukee Valve Company]
- f. [NIBCO INC.]
- g. **<Insert manufacturer's name>**

3. Standards: MSS SP-80 and MSS SP-139.
4. CWP Rating: Minimum **200 psig (1380 kPa)**.
5. Body Design: Horizontal flow.
6. Body Material: ASTM B584, bronze.
7. Ends: Press.
8. Press-End Connections Rating: Minimum **200 psig (1380 kPa)**.
9. Disc: Brass or bronze.

F. Check Valves, Lead Free, Swing Type, Flanged or Threaded Ends - Iron, with Metal Seats, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Anvil; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Clow Valve Company; a subsidiary of McWane, Inc.]
- e. [Cooper Valves]
- f. [Crane Fluid Systems; Crane Co.]
- g. [DeZURIK]
- h. [GA Industries, Inc.]
- i. [Hammond Valve]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Milwaukee Valve Company]
- p. [Powell Valves]
- q. [Victaulic Company]
- r. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [ASC Engineered Solutions]
- d. [Clow Valve Company; a subsidiary of McWane, Inc.]
- e. [Cooper Valves]

- f. [Crane Fluid Systems; Crane Co.]
 - g. [DeZURIK]
 - h. [GA Industries, Inc]
 - i. [Hammond Valve]
 - j. [Jenkins Valves; a Crane Co. brand]
 - k. [Jomar Valve]
 - l. [Kennedy Valve Company; a division of McWane, Inc.]
 - m. [KITZ Corporation]
 - n. [Lance Valves]
 - o. [Milwaukee Valve Company]
 - p. [Powell Valves]
 - q. [Victaulic Company]
 - r. <Insert manufacturer's name>
 3. Standard: MSS SP-71, Type I.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Design: Clear or full waterway.
 6. Body Material: ASTM A126, gray iron with bolted bonnet.
 7. Ends: Flanged or threaded. See Part 3 check valve schedule articles.
 8. Trim: Bronze.
 9. Gasket: Asbestos free.
- G. Check Valves, Lead Free, Swing Type, Flanged or Threaded Ends - Iron, with Nonmetallic-to-Metal Seats, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [ASC Engineered Solutions]
 - b. [Cooper Valves]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [DeZURIK]
 - e. [Kennedy Valve Company; a division of McWane, Inc.]
 - f. [KITZ Corporation]
 - g. [Lance Valves]
 - h. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - i. [Victaulic Company]
 - j. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [ASC Engineered Solutions]
 - b. [Cooper Valves]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [DeZURIK]
 - e. [Kennedy Valve Company; a division of McWane, Inc.]
 - f. [KITZ Corporation]
 - g. [Lance Valves]
 - h. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - i. [Victaulic Company]

j. <Insert manufacturer's name>

3. Standard: MSS SP-71, Type I.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Clear or full waterway.
6. Body Material: ASTM A126, gray iron with bolted bonnet.
7. Ends: Flanged or threaded. See Part 3 check valve schedule articles.
8. Trim: Composition.
9. Seat Ring: Bronze.
10. Disc Holder: Bronze.
11. Disc: PTFE.
12. Gasket: Asbestos free.

H. Check Valves, Lead Free, Swing Type, Flanged or Threaded Ends - Iron, with Metal Seats, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Cooper Valves]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Hammond Valve]**
 - h. **[Jenkins Valves; a Crane Co. brand]**
 - i. **[KITZ Corporation]**
 - j. **[Lance Valves]**
 - k. **[Milwaukee Valve Company]**
 - l. **[Powell Valves]**
 - m. **[Victaulic Company]**
 - n. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Cooper Valves]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Hammond Valve]**
 - h. **[Jenkins Valves; a Crane Co. brand]**
 - i. **[KITZ Corporation]**
 - j. **[Lance Valves]**
 - k. **[Milwaukee Valve Company]**
 - l. **[Powell Valves]**
 - m. **[Victaulic Company]**
 - n. **<Insert manufacturer's name>**
3. Standard: MSS SP-71, Type I.

4. CWP Rating: **500 psig (3450 kPa)**.
 5. Body Design: Clear or full waterway.
 6. Body Material: ASTM A126, gray iron with bolted bonnet.
 7. Ends: Flanged or threaded. See Part 3 check valve schedule articles.
 8. Trim: Bronze.
 9. Gasket: Asbestos free.
- I. Check Valves, Lead Free, Swing Type, Flanged or Threaded Ends - Iron, with Lever- and Spring-Closure Control, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - h. **<Insert manufacturer's name>**
 3. Standard: MSS SP-71, Type I.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Design: Clear or full waterway.
 6. Body Material: ASTM A126, gray iron with bolted bonnet.
 7. Ends: Flanged or threaded. See Part 3 check valve schedule articles.
 8. Trim: Bronze.
 9. Gasket: Asbestos free.
 10. Closure Control: Factory-installed exterior lever and weight.
- J. Check Valves, Lead Free, Swing Type, Flanged or Threaded Ends - Iron, with Lever- and Weight-Closure Control, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[ASC Engineered Solutions]**

- c. [Clow Valve Company; a subsidiary of McWane, Inc.]
- d. [Cooper Valves]
- e. [Crispin Valve]
- f. [DeZURIK]
- g. [GA Industries, Inc]
- h. [Kennedy Valve Company; a division of McWane, Inc.]
- i. [Milwaukee Valve Company]
- j. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [ASC Engineered Solutions]
- c. [Clow Valve Company; a subsidiary of McWane, Inc.]
- d. [Cooper Valves]
- e. [Crispin Valve]
- f. [DeZURIK]
- g. [GA Industries, Inc]
- h. [Kennedy Valve Company; a division of McWane, Inc.]
- i. [Milwaukee Valve Company]
- j. <Insert manufacturer's name>

- 3. Standard: MSS SP-71, Type I.
- 4. CWP Rating: **200 psig (1380 kPa)**.
- 5. Body Design: Clear or full waterway.
- 6. Body Material: ASTM A126, gray iron with bolted bonnet.
- 7. Ends: Flanged or threaded. See Part 3 check valve schedule articles.
- 8. Trim: Bronze.
- 9. Gasket: Asbestos free.
- 10. Closure Control: Factory-installed exterior lever and weight.

K. Check Valves, Lead Free, Swing Type, Grooved Ends - Iron, 300 CWP:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Anvil; an ASC Engineered Solution]
- b. [ASC Engineered Solutions]
- c. [DeZURIK]
- d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
- e. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
- f. [Victaulic Company]
- g. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
- b. [ASC Engineered Solutions]

- c. [DeZURIK]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - f. [Victaulic Company]
 - g. <Insert manufacturer's name>
 - 3. CWP Rating: **300 psig (2070 kPa)**.
 - 4. Body Material: ASTM A536, ductile iron.
 - 5. Seat: EPDM.
 - 6. Disc: Spring operated, ductile iron or stainless steel.
- L. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Metal Seat, Class 125:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [DFT Inc.]
 - g. [Flomatic Valves; Flomatic Corporation]
 - h. [GA Industries, Inc]
 - i. [Keckley Company]
 - j. [KITZ Corporation]
 - k. [Metraflex Company (The)]
 - l. [Milwaukee Valve Company]
 - m. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - n. [Val-Matic Valve & Manufacturing Corp.]
 - o. [Victaulic Company]
 - p. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [DFT Inc.]
 - g. [Flomatic Valves; Flomatic Corporation]
 - h. [GA Industries, Inc]
 - i. [Keckley Company]
 - j. [KITZ Corporation]
 - k. [Metraflex Company (The)]
 - l. [Milwaukee Valve Company]
 - m. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - n. [Val-Matic Valve & Manufacturing Corp.]
 - o. [Victaulic Company]
 - p. <Insert manufacturer's name>

3. Standard: MSS SP-125.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Material: ASTM A126, gray iron.
6. Style: Compact wafer, spring loaded.
7. Seat: Bronze.

M. Check Valves, Lead Free, Center Guided - Iron, Globe, with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Crispin Valve]**
 - b. **[DFT Inc.]**
 - c. **[Flomatic Valves; Flomatic Corporation]**
 - d. **[GA Industries, Inc]**
 - e. **[KITZ Corporation]**
 - f. **[Metraflex Company (The)]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - i. **[Val-Matic Valve & Manufacturing Corp.]**
 - j. **[WATTS; A Watts Water Technologies Company]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crispin Valve]**
 - b. **[DFT Inc.]**
 - c. **[Flomatic Valves; Flomatic Corporation]**
 - d. **[GA Industries, Inc]**
 - e. **[KITZ Corporation]**
 - f. **[Metraflex Company (The)]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - i. **[Val-Matic Valve & Manufacturing Corp.]**
 - j. **[WATTS; A Watts Water Technologies Company]**
 - k. **<Insert manufacturer's name>**
3. Standard: MSS SP-125.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Material: ASTM A126, gray iron.
6. Style: Globe, spring loaded.
7. Ends: Flange.
8. Seat: Bronze.

N. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Metal Seat, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [DFT Inc.]
 - g. [Flomatic Valves; Flomatic Corporation]
 - h. [GA Industries, Inc]
 - i. [Keckley Company]
 - j. [KITZ Corporation]
 - k. [Metraflex Company (The)]
 - l. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - m. [Victaulic Company]
 - n. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [DFT Inc.]
 - g. [Flomatic Valves; Flomatic Corporation]
 - h. [GA Industries, Inc]
 - i. [Keckley Company]
 - j. [KITZ Corporation]
 - k. [Metraflex Company (The)]
 - l. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - m. [Victaulic Company]
 - n. <Insert manufacturer's name>
3. Standard: MSS SP-125.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
6. Style: Compact wafer, spring loaded.
7. Seat: Bronze.
- O. Check Valves, Lead Free, Center Guided - Iron, Globe, with Metal Seat, Class 150:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Crispin Valve]
 - b. [DFT Inc.]
 - c. [Flomatic Valves; Flomatic Corporation]
 - d. [GA Industries, Inc]
 - e. [Hilton Valves]
 - f. [KITZ Corporation]
 - g. [Metraflex Company (The)]
 - h. [Mueller Steam Specialty; A Watts Water Technologies Company]
 - i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Crispin Valve]
- b. [DFT Inc.]
- c. [Flomatic Valves; Flomatic Corporation]
- d. [GA Industries, Inc]
- e. [Hilton Valves]
- f. [KITZ Corporation]
- g. [Metraflex Company (The)]
- h. [Mueller Steam Specialty; A Watts Water Technologies Company]
- i. <Insert manufacturer's name>

- 3. Standard: MSS SP-125.
- 4. CWP Rating: **300 psig (2070 kPa)**.
- 5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
- 6. Style: Globe, spring loaded.
- 7. Ends: Flange.
- 8. Seat: Bronze.

- P. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Metal Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Anvil; an ASC Engineered Solution]
- b. [Cooper Valves]
- c. [DeZURIK]
- d. [DFT Inc.]
- e. [Flomatic Valves; Flomatic Corporation]
- f. [Keckley Company]
- g. [Metraflex Company (The)]
- h. [Mueller Steam Specialty; A Watts Water Technologies Company]
- i. [Val-Matic Valve & Manufacturing Corp.]
- j. [Victaulic Company]
- k. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
- b. [Cooper Valves]
- c. [DeZURIK]
- d. [DFT Inc.]
- e. [Flomatic Valves; Flomatic Corporation]
- f. [Keckley Company]
- g. [Metraflex Company (The)]
- h. [Mueller Steam Specialty; A Watts Water Technologies Company]
- i. [Val-Matic Valve & Manufacturing Corp.]
- j. [Victaulic Company]
- k. <Insert manufacturer's name>

3. Standard: MSS SP-125.
4. CWP Rating: **400 psig (2760 kPa)**.
5. Body Material: ASTM A126, gray iron.
6. Style: Compact wafer, spring loaded.
7. Seat: Bronze.

Q. Check Valves, Lead Free, Center Guided - Iron, Globe, with Metal Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Metraflex Company (The)]**
 - d. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Metraflex Company (The)]**
 - d. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
3. Standard: MSS SP-125.
4. CWP Rating: **400 psig (2760 kPa)**.
5. Body Material: ASTM A126, gray iron.
6. Style: Globe, spring loaded.
7. Ends: Flange.
8. Seat: Bronze.

R. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Metal Seat, Class 300:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Cooper Valves]**
 - c. **[Crispin Valve]**
 - d. **[DFT Inc.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[Keckley Company]**
 - g. **[Metraflex Company (The)]**
 - h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - i. **[Victaulic Company]**
 - j. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Anvil; an ASC Engineered Solution]**
- b. **[Cooper Valves]**
- c. **[Crispin Valve]**
- d. **[DFT Inc.]**
- e. **[Flomatic Valves; Flomatic Corporation]**
- f. **[Keckley Company]**
- g. **[Metraflex Company (The)]**
- h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
- i. **[Victaulic Company]**
- j. **<Insert manufacturer's name>**

3. Standard: MSS SP-125.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
6. Style: Compact wafer, spring loaded.
7. Seat: Bronze.

- S. Check Valves, Lead Free, Center Guided - Iron, Globe, with Metal Seat, Class 300:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Crispin Valve]**
- b. **[DFT Inc.]**
- c. **[Metraflex Company (The)]**
- d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Crispin Valve]**
- b. **[DFT Inc.]**
- c. **[Metraflex Company (The)]**
- d. **<Insert manufacturer's name>**

3. Standard: MSS SP-125.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
6. Style: Globe, spring loaded.
7. Ends: Flange.
8. Seat: Bronze.

- T. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Cooper Valves]
 - c. [DeZURIK]
 - d. [DFT Inc.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Val-Matic Valve & Manufacturing Corp.]
 - g. [Victaulic Company]
 - h. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Cooper Valves]
 - c. [DeZURIK]
 - d. [DFT Inc.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Val-Matic Valve & Manufacturing Corp.]
 - g. [Victaulic Company]
 - h. <Insert manufacturer's name>
 3. Standard: MSS SP-125.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: ASTM A126, gray iron.
 6. Style: Compact wafer, spring loaded.
 7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.
- U. Check Valves, Lead Free, Center Guided - Iron, Globe, with Resilient Seat, Class 125:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [DFT Inc.]
 - b. [Flomatic Valves; Flomatic Corporation]
 - c. [Val-Matic Valve & Manufacturing Corp.]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [DFT Inc.]
 - b. [Flomatic Valves; Flomatic Corporation]
 - c. [Val-Matic Valve & Manufacturing Corp.]
 - d. <Insert manufacturer's name>
 3. Standard: MSS SP-125.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: ASTM A126, gray iron.
 6. Style: Globe, spring loaded.
 7. Ends: Flange.
 8. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

V. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Resilient Seat, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Cooper Valves]**
 - b. **[DeZURIK]**
 - c. **[DFT Inc.]**
 - d. **[Flomatic Valves; Flomatic Corporation]**
 - e. **[GA Industries, Inc]**
 - f. **[Val-Matic Valve & Manufacturing Corp.]**
 - g. **[Victaulic Company]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cooper Valves]**
 - b. **[DeZURIK]**
 - c. **[DFT Inc.]**
 - d. **[Flomatic Valves; Flomatic Corporation]**
 - e. **[GA Industries, Inc]**
 - f. **[Val-Matic Valve & Manufacturing Corp.]**
 - g. **[Victaulic Company]**
 - h. **<Insert manufacturer's name>**
3. Standard: MSS SP-125.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
6. Style: Compact wafer, spring loaded.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

W. Check Valves, Lead Free, Center Guided - Iron, Globe, with Resilient Seat, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Val-Matic Valve & Manufacturing Corp.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Val-Matic Valve & Manufacturing Corp.]**
 - d. **<Insert manufacturer's name>**

3. Standard: MSS SP-125.
 4. CWP Rating: **300 psig (2070 kPa)**.
 5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
 6. Style: Globe, spring loaded.
 7. Ends: Flange.
 8. Seat: EPDM or NBR. See Part 3 check valve schedule articles.
- X. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Resilient Seat, Class 250:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Cooper Valves]**
 - b. **[DeZURIK]**
 - c. **[DFT Inc.]**
 - d. **[Flomatic Valves; Flomatic Corporation]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cooper Valves]**
 - b. **[DeZURIK]**
 - c. **[DFT Inc.]**
 - d. **[Flomatic Valves; Flomatic Corporation]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 3. Standard: MSS SP-125.
 4. CWP Rating: **400 psig (2760 kPa)**.
 5. Body Material: ASTM A126, gray iron.
 6. Style: Compact wafer, spring loaded.
 7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.
- Y. Check Valves, Lead Free, Center Guided - Iron, Globe, with Resilient Seat, Class 250:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Val-Matic Valve & Manufacturing Corp.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [DFT Inc.]
 - b. [Flomatic Valves; Flomatic Corporation]
 - c. [Val-Matic Valve & Manufacturing Corp.]
 - d. <Insert manufacturer's name>
- 3. Standard: MSS SP-125.
 - 4. CWP Rating: **400 psig (2760 kPa)**.
 - 5. Body Material: ASTM A126, gray iron.
 - 6. Style: Globe, spring loaded.
 - 7. Ends: Flange.
 - 8. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

Z. Check Valves, Lead Free, Center Guided - Iron, Compact Wafer, with Resilient Seat, Class 300:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Cooper Valves]
 - b. [DeZURIK]
 - c. [DFT Inc.]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Cooper Valves]
 - b. [DeZURIK]
 - c. [DFT Inc.]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
- 3. Standard: MSS SP-125.
- 4. CWP Rating: **500 psig (3450 kPa)**.
- 5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
- 6. Style: Compact wafer, spring loaded.
- 7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

AA. Check Valves, Lead Free, Center Guided - Iron, Globe, with Resilient Seat, Class 300:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [DFT Inc.]
 - b. [Flomatic Valves; Flomatic Corporation]
 - c. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - d. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DFT Inc.]**
 - b. **[Flomatic Valves; Flomatic Corporation]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **<Insert manufacturer's name>**
3. Standard: MSS SP-125.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
6. Style: Globe, spring loaded.
7. Ends: Flange.
8. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

BB. Check Valves, Lead Free, Dual-Plate Type - Iron, with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[DeZURIK]**
 - d. **[Flo Fab Inc]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[Jomar Valve]**
 - g. **[Keckley Company]**
 - h. **[Lance Valves]**
 - i. **[Metraflex Company (The)]**
 - j. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - k. **[Stockham; a Crane Co. brand]**
 - l. **[Sure Flow Equipment Inc]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[DeZURIK]**
 - d. **[Flo Fab Inc]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[Jomar Valve]**
 - g. **[Keckley Company]**
 - h. **[Lance Valves]**
 - i. **[Metraflex Company (The)]**
 - j. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - k. **[Stockham; a Crane Co. brand]**
 - l. **[Sure Flow Equipment Inc]**
 - m. **<Insert manufacturer's name>**
3. Standard: API 594.

4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A126, gray iron.
7. Seat: Bronze.

CC. Check Valves, Lead Free, Dual-Plate Type - Iron, with Metal Seat, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[DeZURIK]**
 - d. **[Jomar Valve]**
 - e. **[Keckley Company]**
 - f. **[Lance Valves]**
 - g. **[Metraflex Company (The)]**
 - h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **[Sure Flow Equipment Inc]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[DeZURIK]**
 - d. **[Jomar Valve]**
 - e. **[Keckley Company]**
 - f. **[Lance Valves]**
 - g. **[Metraflex Company (The)]**
 - h. **[Mueller Steam Specialty; A Watts Water Technologies Company]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **[Sure Flow Equipment Inc]**
 - k. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
7. Seat: Bronze.

DD. Check Valves, Lead Free, Dual-Plate Type - Iron, with Metal Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**

- c. [Keckley Company]
 - d. [Stockham; a Crane Co. brand]
 - e. [Sure Flow Equipment Inc]
 - f. [Val-Matic Valve & Manufacturing Corp.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [Keckley Company]
 - d. [Stockham; a Crane Co. brand]
 - e. [Sure Flow Equipment Inc]
 - f. [Val-Matic Valve & Manufacturing Corp.]
 - g. <Insert manufacturer's name>
3. Standard: API 594.
4. CWP Rating: **400 psig (2760 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A126, gray iron.
7. Seat: Bronze.

EE. Check Valves, Lead Free, Dual-Plate Type - Iron, with Metal Seat, Class 300:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [Keckley Company]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Sure Flow Equipment Inc]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [Keckley Company]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Sure Flow Equipment Inc]
 - f. <Insert manufacturer's name>
3. Standard: API 594.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
7. Seat: Bronze.

FF. Check Valves, Lead Free, Single-Plate Type - Iron, with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Flowserve Corporation]**
 - b. **[GA Industries, Inc]**
 - c. **[Jomar Valve]**
 - d. **[Keckley Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flowserve Corporation]**
 - b. **[GA Industries, Inc]**
 - c. **[Jomar Valve]**
 - d. **[Keckley Company]**
 - e. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Wafer, single spring-loaded plate.
6. Body Material: ASTM A126, gray iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

GG. Check Valves, Lead Free, Dual-Plate Type - Iron, with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Flomatic Valves; Flomatic Corporation]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flomatic Valves; Flomatic Corporation]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A126, gray iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

HH. Check Valves, Lead Free, Dual-Plate Type - Iron, with Resilient Seat, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[DeZURIK]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[DeZURIK]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

II. Check Valves, Lead Free, Single-Plate Type - Iron, with Resilient Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Flowserve Corporation]**
 - b. **[GA Industries, Inc]**
 - c. **[Jomar Valve]**
 - d. **[Keckley Company]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flowserve Corporation]**
 - b. **[GA Industries, Inc]**
 - c. **[Jomar Valve]**
 - d. **[Keckley Company]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **400 psig (2760 kPa)**.

5. Body Design: Wafer, single spring-loaded plate.
6. Body Material: ASTM A126, gray iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

JJ. Check Valves, Lead Free, Dual-Plate Type - Iron, with Resilient Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jomar Valve]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jomar Valve]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating: **400 psig (2760 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A126, gray iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

KK. Check Valves, Lead Free, Dual-Plate Type - Iron, with Resilient Seat, Class 300:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Keckley Company]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Keckley Company]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **<Insert manufacturer's name>**

3. Standard: API 594.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Design: Wafer, spring-loaded plates.
6. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
7. Seat: EPDM or NBR. See Part 3 check valve schedule articles.

LL. Check Valves, Lead Free - CPVC, Union-Type Ball Check:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[GF Piping Systems: Georg Fischer LLC]**
 - d. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - e. **[IPEX USA LLC]**
 - f. **[NIBCO INC.]**
 - g. **[Spears Manufacturing Company]**
 - h. **[Thermoplastic Valves, Inc]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Asahi/America]**
 - c. **[GF Piping Systems: Georg Fischer LLC]**
 - d. **[Hayward Flow Control; Hayward Industries, Inc.]**
 - e. **[IPEX USA LLC]**
 - f. **[NIBCO INC.]**
 - g. **[Spears Manufacturing Company]**
 - h. **[Thermoplastic Valves, Inc]**
 - i. **<Insert manufacturer's name>**
3. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 check valve schedule articles.
4. Body Material: CPVC.
5. Body Design: Union-type ball check.
6. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded. See Part 3 check valve schedule articles.
7. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Detachable, socket, socket or threaded, threaded, flanged. See Part 3 check valve schedule articles.
8. Ball: CPVC.
9. Seals: EPDM- or FKM-rubber O-rings.

MM. Check Valves, Lead Free - PVC, Union-Type Ball Check:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Valve, Inc]**

- b. [Asahi/America]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [Hayward Flow Control; Hayward Industries, Inc.]
 - e. [IPEX USA LLC]
 - f. [NIBCO INC.]
 - g. [Spears Manufacturing Company]
 - h. [Thermoplastic Valves, Inc]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [American Valve, Inc]
 - b. [Asahi/America]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [Hayward Flow Control; Hayward Industries, Inc.]
 - e. [IPEX USA LLC]
 - f. [NIBCO INC.]
 - g. [Spears Manufacturing Company]
 - h. [Thermoplastic Valves, Inc]
 - i. <Insert manufacturer's name>
3. Pressure Rating and Temperature: **125 psig (860 kPa)**, **150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 check valve schedule articles.
4. Body Material: PVC.
5. Body Design: Union-type ball check.
6. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded. See Part 3 check valve schedule articles.
7. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Detachable, **[socket][socket or threaded][threaded][flange]**.
8. Ball: PVC.
9. Seals: EPDM- or FKM-rubber O-rings.

2.8 CHECK VALVES, GENERAL PURPOSE

A. Check Valves, Lift Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Jenkins Valves; a Crane Co. brand]
 - g. [Jomar Valve]
 - h. [Keckley Company]
 - i. [Metraflex Company (The)]
 - j. [Milwaukee Valve Company]
 - k. [NIBCO INC.]

- l. [Stockham; a Crane Co. brand]
 - m. [Val-Matic Valve & Manufacturing Corp.]
 - n. [Victaulic Company]
 - o. [WATTS; A Watts Water Technologies Company]
 - p. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [American Valve, Inc]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Jenkins Valves; a Crane Co. brand]
 - g. [Jomar Valve]
 - h. [Keckley Company]
 - i. [Metraflex Company (The)]
 - j. [Milwaukee Valve Company]
 - k. [NIBCO INC.]
 - l. [Stockham; a Crane Co. brand]
 - m. [Val-Matic Valve & Manufacturing Corp.]
 - n. [Victaulic Company]
 - o. [WATTS; A Watts Water Technologies Company]
 - p. <Insert manufacturer's name>
 3. Standard: MSS SP-80, Type 1.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Design: Vertical flow.
 6. Body Material: ASTM B61 or ASTM B62, bronze.
 7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
 8. Disc: Bronze.
- B. Check Valves, Lift Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Crane Fluid Systems; Crane Co.]
 - b. [Jenkins Valves; a Crane Co. brand]
 - c. [Jomar Valve]
 - d. [Keckley Company]
 - e. [Lance Valves]
 - f. [Milwaukee Valve Company]
 - g. [NIBCO INC.]
 - h. [Red-White Valve Corp.]
 - i. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - j. [Stockham; a Crane Co. brand]
 - k. [Val-Matic Valve & Manufacturing Corp.]
 - l. [Victaulic Company]
 - m. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Crane Fluid Systems; Crane Co.]
- b. [Jenkins Valves; a Crane Co. brand]
- c. [Jomar Valve]
- d. [Keckley Company]
- e. [Lance Valves]
- f. [Milwaukee Valve Company]
- g. [NIBCO INC.]
- h. [Red-White Valve Corp.]
- i. [Shurjoint; a part of Aalberts Integrated Piping Systems]
- j. [Stockham; a Crane Co. brand]
- k. [Val-Matic Valve & Manufacturing Corp.]
- l. [Victaulic Company]
- m. <Insert manufacturer's name>

- 3. Standard: MSS SP-80, Type 2.
- 4. CWP Rating: **200 psig (1380 kPa)**.
- 5. Body Design: Vertical flow.
- 6. Body Material: ASTM B61 or ASTM B62, bronze.
- 7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
- 8. Disc: NBR or PTFE.

C. Check Valves, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 125:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Jenkins Valves; a Crane Co. brand]
- d. [Jomar Valve]
- e. [Keckley Company]
- f. [Lance Valves]
- g. [Milwaukee Valve Company]
- h. [NIBCO INC.]
- i. [Red-White Valve Corp.]
- j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
- k. [Stockham; a Crane Co. brand]
- l. [Val-Matic Valve & Manufacturing Corp.]
- m. [Victaulic Company]
- n. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Jenkins Valves; a Crane Co. brand]
- d. [Jomar Valve]
- e. [Keckley Company]

- f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Red-White Valve Corp.]
 - j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - k. [Stockham; a Crane Co. brand]
 - l. [Val-Matic Valve & Manufacturing Corp.]
 - m. [Victaulic Company]
 - n. <Insert manufacturer's name>
- 3. Standard: MSS SP-80, Type 3.
 - 4. CWP Rating: **200 psig (1380 kPa)**.
 - 5. Body Design: Horizontal flow.
 - 6. Body Material: ASTM B62, bronze.
 - 7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
 - 8. Disc: Bronze.
- D. Check Valves, Swing Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc, Class 125:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Powell Valves]
 - j. [Red-White Valve Corp.]
 - k. [Stockham; a Crane Co. brand]
 - l. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Jenkins Valves; a Crane Co. brand]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [NIBCO INC.]
 - i. [Powell Valves]
 - j. [Red-White Valve Corp.]
 - k. [Stockham; a Crane Co. brand]
 - l. <Insert manufacturer's name>
 - 3. Standard: MSS SP-80, Type 4.
 - 4. CWP Rating: **200 psig (1380 kPa)**.

5. Body Design: Horizontal flow.
6. Body Material: ASTM B62, bronze.
7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
8. Disc: PTFE.

E. Check Valves, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Legend Valve & Fitting, Inc]**
 - i. **[Milwaukee Valve Company]**
 - j. **[NIBCO INC.]**
 - k. **[Powell Valves]**
 - l. **[Red-White Valve Corp.]**
 - m. **[Stockham; a Crane Co. brand]**
 - n. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Hammond Valve]**
 - e. **[Jenkins Valves; a Crane Co. brand]**
 - f. **[Jomar Valve]**
 - g. **[Lance Valves]**
 - h. **[Legend Valve & Fitting, Inc]**
 - i. **[Milwaukee Valve Company]**
 - j. **[NIBCO INC.]**
 - k. **[Powell Valves]**
 - l. **[Red-White Valve Corp.]**
 - m. **[Stockham; a Crane Co. brand]**
 - n. **<Insert manufacturer's name>**
3. Standard: MSS SP-80, Type 3.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Design: Horizontal flow.
6. Body Material: ASTM B62, bronze.
7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
8. Disc: Bronze.

F. Check Valves, Swing Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Crane Fluid Systems; Crane Co.]**
 - b. **[Jenkins Valves; a Crane Co. brand]**
 - c. **[Jomar Valve]**
 - d. **[Lance Valves]**
 - e. **[Milwaukee Valve Company]**
 - f. **[NIBCO INC.]**
 - g. **[Powell Valves]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crane Fluid Systems; Crane Co.]**
 - b. **[Jenkins Valves; a Crane Co. brand]**
 - c. **[Jomar Valve]**
 - d. **[Lance Valves]**
 - e. **[Milwaukee Valve Company]**
 - f. **[NIBCO INC.]**
 - g. **[Powell Valves]**
 - h. **[Red-White Valve Corp.]**
 - i. **[Stockham; a Crane Co. brand]**
 - j. **<Insert manufacturer's name>**
 3. Standard: MSS SP-80, Type 4.
 4. CWP Rating: **300 psig (2070 kPa)**.
 5. Body Design: Horizontal flow.
 6. Body Material: ASTM B62, bronze.
 7. Ends: Threaded or soldered ends. See Part 3 check valve schedule articles.
 8. Disc: PTFE.
- G. Check Valves, Swing Type, Flanged Ends - Iron, with Metal Seats, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - d. **[Cooper Valves]**
 - e. **[Crane Fluid Systems; Crane Co.]**
 - f. **[DeZURIK]**
 - g. **[FNW; Ferguson Enterprises, Inc.]**
 - h. **[GA Industries, Inc]**
 - i. **[Hammond Valve]**
 - j. **[Jenkins Valves; a Crane Co. brand]**
 - k. **[Jomar Valve]**

- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Milwaukee Valve Company]
- p. [Powell Valves]
- q. [Victaulic Company]
- r. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Clow Valve Company; a subsidiary of McWane, Inc.]
- d. [Cooper Valves]
- e. [Crane Fluid Systems; Crane Co.]
- f. [DeZURIK]
- g. [FNW; Ferguson Enterprises, Inc.]
- h. [GA Industries, Inc]
- i. [Hammond Valve]
- j. [Jenkins Valves; a Crane Co. brand]
- k. [Jomar Valve]
- l. [Kennedy Valve Company; a division of McWane, Inc.]
- m. [KITZ Corporation]
- n. [Lance Valves]
- o. [Milwaukee Valve Company]
- p. [Powell Valves]
- q. [Victaulic Company]
- r. <Insert manufacturer's name>

- 3. Standard: MSS SP-71, Type I.
- 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa)**.
- 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa)**.
- 6. Body Design: Clear or full waterway.
- 7. Body Material: ASTM A126, gray iron with bolted bonnet.
- 8. Ends: Flanged.
- 9. Trim: Bronze.
- 10. Gasket: Asbestos free.

- H. Check Valves, Swing Type, Flanged Ends - Iron, with Nonmetallic-to-Metal Seats, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Cooper Valves]
- b. [Crane Fluid Systems; Crane Co.]
- c. [DeZURIK]
- d. [Kennedy Valve Company; a division of McWane, Inc.]
- e. [KITZ Corporation]
- f. [Lance Valves]
- g. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]

- h. **[Victaulic Company]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cooper Valves]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[DeZURIK]**
 - d. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - e. **[KITZ Corporation]**
 - f. **[Lance Valves]**
 - g. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - h. **[Victaulic Company]**
 - i. **<Insert manufacturer's name>**
 3. Standard: MSS SP-71, Type I.
 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa).**
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa).**
 6. Body Design: Clear or full waterway.
 7. Body Material: ASTM A126, gray iron with bolted bonnet.
 8. Ends: Flanged.
 9. Trim: Composition.
 10. Seat Ring: Bronze.
 11. Disc Holder: Bronze.
 12. Disc: PTFE.
 13. Gasket: Asbestos free.
- I. Check Valves, Swing Type, Flanged Ends - Iron, with Metal Seats, Class 250:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Cooper Valves]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[GA Industries, Inc]**
 - h. **[Hammond Valve]**
 - i. **[Jenkins Valves; a Crane Co. brand]**
 - j. **[KITZ Corporation]**
 - k. **[Lance Valves]**
 - l. **[Milwaukee Valve Company]**
 - m. **[Powell Valves]**
 - n. **[Victaulic Company]**
 - o. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Cooper Valves]
- c. [Crane Fluid Systems; Crane Co.]
- d. [Crispin Valve]
- e. [DeZURIK]
- f. [FNW; Ferguson Enterprises, Inc.]
- g. [GA Industries, Inc]
- h. [Hammond Valve]
- i. [Jenkins Valves; a Crane Co. brand]
- j. [KITZ Corporation]
- k. [Lance Valves]
- l. [Milwaukee Valve Company]
- m. [Powell Valves]
- n. [Victaulic Company]
- o. <Insert manufacturer's name>

- 3. Standard: MSS SP-71, Type I.
- 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **500 psig (3450 kPa).**
- 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa).**
- 6. Body Design: Clear or full waterway.
- 7. Body Material: ASTM A126, gray iron with bolted bonnet.
- 8. Ends: Flanged.
- 9. Trim: Bronze.
- 10. Gasket: Asbestos free.

J. Check Valves, Swing Type, Flanged Ends - Iron, with Lever- and Spring-Closure Control, Class 125:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Clow Valve Company; a subsidiary of McWane, Inc.]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [GA Industries, Inc]
 - g. [Kennedy Valve Company; a division of McWane, Inc.]
 - h. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Clow Valve Company; a subsidiary of McWane, Inc.]
 - c. [Cooper Valves]
 - d. [Crispin Valve]
 - e. [DeZURIK]
 - f. [GA Industries, Inc]
 - g. [Kennedy Valve Company; a division of McWane, Inc.]
 - h. <Insert manufacturer's name>
- 3. Standard: MSS SP-71, Type I.

4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa).**
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa).**
 6. Body Design: Clear or full waterway.
 7. Body Material: ASTM A126, gray iron with bolted bonnet.
 8. Ends: Flanged.
 9. Trim: Bronze.
 10. Gasket: Asbestos free.
 11. Closure Control: Factory-installed, exterior lever and spring.
- K. Check Valves, Swing Type, Flanged Ends - Iron, with Lever- and Weight-Closure Control, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - h. **[Milwaukee Valve Company]**
 - i. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crispin Valve]**
 - e. **[DeZURIK]**
 - f. **[GA Industries, Inc]**
 - g. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - h. **[Milwaukee Valve Company]**
 - i. **<Insert manufacturer's name>**
 3. Standard: MSS SP-71, Type I.
 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa).**
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa).**
 6. Body Design: Clear or full waterway.
 7. Body Material: ASTM A126, gray iron with bolted bonnet.
 8. Ends: Flanged.
 9. Trim: Bronze.
 10. Gasket: Asbestos free.
 11. Closure Control: Factory-installed, exterior lever and weight.
- L. Check Valves, Swing Type, Grooved Ends - Iron, 300 CWP:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Anvil; an ASC Engineered Solution]
 - b. [DeZURIK]
 - c. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - d. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Anvil; an ASC Engineered Solution]
 - b. [DeZURIK]
 - c. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - d. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
3. CWP Rating: **300 psig (2070 kPa)**.
 4. Body Material: ASTM A536, ductile iron.
 5. Seat: NBR.
 6. Disc: Spring operated, ductile iron or stainless steel.

M. Check Valves, Dual-Plate Type - Iron, with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [DeZURIK]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [Jomar Valve]
 - f. [Keckley Company]
 - g. [Lance Valves]
 - h. [Legend Valve & Fitting, Inc]
 - i. [Metraflex Company (The)]
 - j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - k. [Stockham; a Crane Co. brand]
 - l. [Sure Flow Equipment Inc]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [DeZURIK]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [Jomar Valve]

- f. [Keckley Company]
 - g. [Lance Valves]
 - h. [Legend Valve & Fitting, Inc]
 - i. [Metraflex Company (The)]
 - j. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - k. [Stockham; a Crane Co. brand]
 - l. [Sure Flow Equipment Inc]
 - m. <Insert manufacturer's name>
- 3. Standard: API 594.
 - 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa)**.
 - 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa)**.
 - 6. Body Design: Wafer, spring-loaded plates.
 - 7. Body Material: ASTM A126, gray iron.
 - 8. Seat: Bronze.
- N. Check Valves, Dual-Plate Type - Iron, with Metal Seat, Class 150:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [DeZURIK]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Legend Valve & Fitting, Inc]
 - h. [Metraflex Company (The)]
 - i. [Stockham; a Crane Co. brand]
 - j. [Sure Flow Equipment Inc]
 - k. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [ABZ Valve; an ASC Engineered Solution]
 - b. [Anvil; an ASC Engineered Solution]
 - c. [DeZURIK]
 - d. [Jomar Valve]
 - e. [Keckley Company]
 - f. [Lance Valves]
 - g. [Legend Valve & Fitting, Inc]
 - h. [Metraflex Company (The)]
 - i. [Stockham; a Crane Co. brand]
 - j. [Sure Flow Equipment Inc]
 - k. <Insert manufacturer's name>
 - 3. Standard: API 594.
 - 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **300 psig (2070 kPa)**.
 - 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **250 psig (1725 kPa)**.
 - 6. Body Design: Wafer, spring-loaded plates.
 - 7. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.

8. Seat: Bronze.

O. Check Valves, Dual-Plate Type - Iron, with Metal Seat, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[Keckley Company]**
 - d. **[Stockham; a Crane Co. brand]**
 - e. **[Sure Flow Equipment Inc]**
 - f. **[Val-Matic Valve & Manufacturing Corp.]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[Keckley Company]**
 - d. **[Stockham; a Crane Co. brand]**
 - e. **[Sure Flow Equipment Inc]**
 - f. **[Val-Matic Valve & Manufacturing Corp.]**
 - g. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **400 psig (2760 kPa).**
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa).**
6. Body Design: Wafer, spring-loaded plates.
7. Body Material: ASTM A126, gray iron.
8. Seat: Bronze.

P. Check Valves, Dual-Plate Type - Iron, with Metal Seat, Class 300:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABZ Valve; an ASC Engineered Solution]**
 - b. **[Anvil; an ASC Engineered Solution]**
 - c. **[Keckley Company]**
 - d. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - e. **[Sure Flow Equipment Inc]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABZ Valve; an ASC Engineered Solution]**

- b. [Anvil; an ASC Engineered Solution]
 - c. [Keckley Company]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Sure Flow Equipment Inc]
 - f. <Insert manufacturer's name>
 3. Standard: API 594.
 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **500 psig (3450 kPa)**.
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **400 psig (2760 kPa)**.
 6. Body Design: Wafer, spring-loaded plates.
 7. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
 8. Seat: Bronze.
- Q. Check Valves, Single-Plate Type - Iron, with Resilient Seat, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [GA Industries, Inc]
 - b. [Jomar Valve]
 - c. [Keckley Company]
 - d. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [GA Industries, Inc]
 - b. [Jomar Valve]
 - c. [Keckley Company]
 - d. <Insert manufacturer's name>
 3. Standard: API 594.
 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa)**.
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa)**.
 6. Body Design: Wafer, single spring-loaded plate.
 7. Body Material: ASTM A126, gray iron.
 8. Seat: NBR.
- R. Check Valves, Dual-Plate Type - Iron, with Resilient Seat, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Flomatic Valves; Flomatic Corporation]
 - b. [Keckley Company]
 - c. [Stockham; a Crane Co. brand]
 - d. [Sure Flow Equipment Inc]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. [Flomatic Valves; Flomatic Corporation]
- b. [Keckley Company]
- c. [Stockham; a Crane Co. brand]
- d. [Sure Flow Equipment Inc]
- e. <Insert manufacturer's name>

- 3. Standard: API 594.
- 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa)**.
- 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa)**.
- 6. Body Design: Wafer, spring-loaded plates.
- 7. Body Material: ASTM A126, gray iron.
- 8. Seat: NBR.

S. Check Valves, Dual-Plate Type - Iron, with Resilient Seat, Class 150:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [DeZURIK]
 - b. [Keckley Company]
 - c. [Stockham; a Crane Co. brand]
 - d. [Sure Flow Equipment Inc]
 - e. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [DeZURIK]
 - b. [Keckley Company]
 - c. [Stockham; a Crane Co. brand]
 - d. [Sure Flow Equipment Inc]
 - e. <Insert manufacturer's name>
- 3. Standard: API 594.
- 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **300 psig (2070 kPa)**.
- 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **250 psig (1725 kPa)**.
- 6. Body Design: Wafer, spring-loaded plates.
- 7. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
- 8. Seat: NBR.

T. Check Valves, Single-Plate Type - Iron, with Resilient Seat, Class 250:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [GA Industries, Inc]
 - b. [Jomar Valve]
 - c. [Keckley Company]

- d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[GA Industries, Inc]**
 - b. **[Jomar Valve]**
 - c. **[Keckley Company]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **400 psig (2760 kPa).**
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa).**
6. Body Design: Wafer, single spring-loaded plate.
7. Body Material: ASTM A126, gray iron.
8. Seat: NBR.
- U. Check Valves, Dual-Plate Type - Iron, with Resilient Seat, Class 250:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[Jomar Valve]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Jomar Valve]**
 - b. **[Keckley Company]**
 - c. **[Stockham; a Crane Co. brand]**
 - d. **[Sure Flow Equipment Inc]**
 - e. **[Val-Matic Valve & Manufacturing Corp.]**
 - f. **<Insert manufacturer's name>**
3. Standard: API 594.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **400 psig (2760 kPa).**
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa).**
6. Body Design: Wafer, spring-loaded plates.
7. Body Material: ASTM A126, gray iron.
8. Seat: NBR.
- V. Check Valves, Dual-Plate Type - Iron, with Resilient Seat, Class 300:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[Keckley Company]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Keckley Company]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Sure Flow Equipment Inc]**
 - d. **<Insert manufacturer's name>**
3. Standard: API 594.
 4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **500 psig (3450 kPa)**.
 5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **400 psig (2760 kPa)**.
 6. Body Design: Wafer, spring-loaded plates.
 7. Body Material: ASTM A395/A395M or ASTM A536, ductile iron.
 8. Seat: NBR.

2.9 GATE VALVES, LEAD FREE

A. Gate Valves, Lead Free, Threaded or Soldered Ends - Bronze, NRS, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Jenkins Valves; a Crane Co. brand]**
 - e. **[KITZ Corporation]**
 - f. **[Lance Valves]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Powell Valves]**
 - i. **[Red-White Valve Corp.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Jenkins Valves; a Crane Co. brand]**

- e. [KITZ Corporation]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [Powell Valves]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
 3. Standard: MSS SP-80, Type 1.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: Bronze with integral seat and screw-in bonnet.
 6. Ends: Threaded or solder joint. See Part 3 gate valve schedule articles.
 7. Stem: Bronze.
 8. Disc: Solid wedge, bronze.
 9. Packing: Asbestos free.
 10. Handwheel: Malleable iron[, **bronze, or aluminum**].
- B. Gate Valves, Lead Free, Threaded or Soldered Ends - Bronze, RS, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [NIBCO INC.]
 - h. [Powell Valves]
 - i. [Stockham; a Crane Co. brand]
 - j. [WATTS; A Watts Water Technologies Company]
 - k. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [NIBCO INC.]
 - h. [Powell Valves]
 - i. [Stockham; a Crane Co. brand]
 - j. [WATTS; A Watts Water Technologies Company]
 - k. <Insert manufacturer's name>
 3. Standard: MSS SP-80, Type 2.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: Bronze with integral seat and screw-in bonnet.

6. Ends: Threaded or solder joint. See Part 3 gate valve schedule articles.
7. Stem: Bronze.
8. Disc: Solid wedge, bronze.
9. Packing: Asbestos free.
10. Handwheel: Malleable iron, bronze, or aluminum.

C. Gate Valves, Lead Free, Threaded Ends - Bronze, NRS, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Jenkins Valves; a Crane Co. brand]**
 - e. **[KITZ Corporation]**
 - f. **[Lance Valves]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Powell Valves]**
 - i. **[Red-White Valve Corp.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Valve, Inc]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Crane Fluid Systems; Crane Co.]**
 - d. **[Jenkins Valves; a Crane Co. brand]**
 - e. **[KITZ Corporation]**
 - f. **[Lance Valves]**
 - g. **[Milwaukee Valve Company]**
 - h. **[Powell Valves]**
 - i. **[Red-White Valve Corp.]**
 - j. **[Stockham; a Crane Co. brand]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **<Insert manufacturer's name>**
3. Standard: MSS SP-80, Type 1.
4. CWP Rating: **300 psig (2070 kPa)**.
5. Body Material: Bronze with integral seat and union-ring bonnet.
6. Ends: Threaded.
7. Stem: Bronze.
8. Disc: Solid wedge, bronze.
9. Packing: Asbestos free.
10. Handwheel: Malleable iron[, **bronze, or aluminum**].

D. Gate Valves, Lead Free, Threaded Ends - Bronze, RS, Class 150:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Hammond Valve]
- d. [Jenkins Valves; a Crane Co. brand]
- e. [KITZ Corporation]
- f. [Milwaukee Valve Company]
- g. [Powell Valves]
- h. [Stockham; a Crane Co. brand]
- i. [WATTS; A Watts Water Technologies Company]
- j. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Hammond Valve]
- d. [Jenkins Valves; a Crane Co. brand]
- e. [KITZ Corporation]
- f. [Milwaukee Valve Company]
- g. [Powell Valves]
- h. [Stockham; a Crane Co. brand]
- i. [WATTS; A Watts Water Technologies Company]
- j. <Insert manufacturer's name>

- 3. Standard: MSS SP-80, Type 2.
- 4. CWP Rating: **300 psig (2070 kPa)**.
- 5. Body Material: Bronze with integral seat and union-ring bonnet.
- 6. Ends: Threaded.
- 7. Stem: Bronze.
- 8. Disc: Solid wedge, bronze.
- 9. Packing: Asbestos free.
- 10. Handwheel: Malleable iron[, **bronze, or aluminum**].

E. Gate Valves, Lead Free, Press Ends - Bronze:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
- c. [Hammond Valve]
- d. [Milwaukee Valve Company]
- e. [NIBCO INC.]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
- c. [Hammond Valve]
- d. [Milwaukee Valve Company]
- e. [NIBCO INC.]
- f. <Insert manufacturer's name>

- 3. Standards: MSS SP-80 and MSS SP-139.
- 4. CWP Rating: Minimum **200 psig (1380 kPa)**.
- 5. Body Material: Bronze with integral seat and union-ring bonnet.
- 6. Ends: Press.
- 7. Press Ends Connection Rating: Minimum **200 psig (1380 kPa)**.
- 8. Stem: Brass or bronze, RS or NRS. See Part 3 gate valve schedule articles.
- 9. Disc: Solid wedge, bronze.
- 10. Packing: Graphite.
- 11. Port: Full.
- 12. Handwheel: Malleable iron, bronze, or aluminum.

F. Gate Valves, Lead Free, Flanged Ends - Iron, NRS, Class 125:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Clow Valve Company; a subsidiary of McWane, Inc.]
 - c. [Cooper Valves]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Jenkins Valves; a Crane Co. brand]
 - g. [Jomar Valve]
 - h. [Kennedy Valve Company; a division of McWane, Inc.]
 - i. [KITZ Corporation]
 - j. [Lance Valves]
 - k. [Powell Valves]
 - l. [Zurn Industries, LLC]
 - m. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Clow Valve Company; a subsidiary of McWane, Inc.]
 - c. [Cooper Valves]
 - d. [Crane Fluid Systems; Crane Co.]
 - e. [Flomatic Valves; Flomatic Corporation]
 - f. [Jenkins Valves; a Crane Co. brand]
 - g. [Jomar Valve]
 - h. [Kennedy Valve Company; a division of McWane, Inc.]
 - i. [KITZ Corporation]
 - j. [Lance Valves]
 - k. [Powell Valves]
 - l. [Zurn Industries, LLC]

- m. <Insert manufacturer's name>
3. Standard: MSS SP-70, Type I.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: Gray iron with bolted bonnet.
 6. Ends: Flanged.
 7. Trim: Bronze.
 8. Disc: Solid wedge.
 9. Packing and Gasket: Asbestos free.
- G. Gate Valves, Lead Free, Flanged Ends - Iron, OS&Y, Class 125:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[Hammond Valve]**
 - d. **[Jomar Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[KITZ Corporation]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[Powell Valves]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **[Zurn Industries, LLC]**
 - m. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[Hammond Valve]**
 - d. **[Jomar Valve]**
 - e. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - f. **[KITZ Corporation]**
 - g. **[Lance Valves]**
 - h. **[Milwaukee Valve Company]**
 - i. **[Powell Valves]**
 - j. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - k. **[WATTS; A Watts Water Technologies Company]**
 - l. **[Zurn Industries, LLC]**
 - m. <Insert manufacturer's name>
 3. Standard: MSS SP-70, Type I.
 4. CWP Rating: **200 psig (1380 kPa)**.
 5. Body Material: Gray iron with bolted bonnet.
 6. Ends: Flange.
 7. Trim: Bronze.

8. Disc: Solid wedge.
9. Packing and Gasket: Asbestos free.

H. Gate Valves, Lead Free, Flanged Ends - Iron, NRS, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[Jenkins Valves; a Crane Co. brand]**
 - g. **[KITZ Corporation]**
 - h. **[Victaulic Company]**
 - i. **[Zurn Industries, LLC]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[Jenkins Valves; a Crane Co. brand]**
 - g. **[KITZ Corporation]**
 - h. **[Victaulic Company]**
 - i. **[Zurn Industries, LLC]**
 - j. **<Insert manufacturer's name>**
3. Standard: MSS SP-70, Type I.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Material: Gray iron with bolted bonnet.
6. Ends: Flange.
7. Trim: Bronze.
8. Disc: Solid wedge.
9. Packing and Gasket: Asbestos free.

I. Gate Valves, Lead Free, Flanged Ends - Iron, OS&Y, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[Hammond Valve]**
 - d. **[KITZ Corporation]**

- e. [Milwaukee Valve Company]
 - f. [Powell Valves]
 - g. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - h. [Victaulic Company]
 - i. [WATTS; A Watts Water Technologies Company]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [KITZ Corporation]
 - e. [Milwaukee Valve Company]
 - f. [Powell Valves]
 - g. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - h. [Victaulic Company]
 - i. [WATTS; A Watts Water Technologies Company]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
3. Standard: MSS SP-70, Type I.
4. CWP Rating: **500 psig (3450 kPa)**.
5. Body Material: Gray iron with bolted bonnet.
6. Ends: Flanged.
7. Trim: Bronze.
8. Disc: Solid wedge.
9. Packing and Gasket: Asbestos free.

J. Gate Valves - CPVC:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [Asahi/America]
 - b. [KITZ Corporation]
 - c. [Spears Manufacturing Company]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Asahi/America]
 - b. [KITZ Corporation]
 - c. [Spears Manufacturing Company]
 - d. <Insert manufacturer's name>
3. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure

- at **73 deg F (23 deg C)** or other temperature. See Part 3 gate valve schedule articles.
- 4. Body Material: CPVC.
- 5. Body Design: NRS.
- 6. End Connections for Valves NPS 2 (DN 50) and Smaller: Socket or threaded. See Part 3 gate valve schedule articles.
- 7. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Socket, socket or threaded, threaded, flanged. See Part 3 gate valve schedule articles.
- 8. Gate and Stem: Plastic.
- 9. Seals: EPDM rubber.
- 10. Handle: Wheel.

K. Gate Valves - PVC:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Asahi/America]**
 - b. **[KITZ Corporation]**
 - c. **[Spears Manufacturing Company]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Asahi/America]**
 - b. **[KITZ Corporation]**
 - c. **[Spears Manufacturing Company]**
 - d. **<Insert manufacturer's name>**
- 3. Pressure Rating and Temperature: **125 psig (860 kPa), 150 psig (1035 kPa)**, or other pressure at **73 deg F (23 deg C)** or other temperature. See Part 3 gate valve schedule articles.
- 4. Body Material: PVC.
- 5. Body Design: NRS.
- 6. End Connections for Valves NPS 2 (DN 50) and Smaller: Socket or threaded. See Part 3 gate valve schedule articles.
- 7. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Socket, socket or threaded, threaded, or flanged.
- 8. Gate and Stem: Plastic.
- 9. Seals: EPDM rubber.
- 10. Handle: Wheel.

2.10 GATE VALVES, GENERAL PURPOSE

A. Gate Valves, Threaded or Soldered Ends - Bronze, NRS, Class 125:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[American Valve, Inc]**

- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [Powell Valves]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Valve, Inc]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [Powell Valves]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
3. Standard: MSS SP-80, Type 1.
4. CWP Rating: **200 psig (1380 kPa)**.
5. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
6. Ends: Threaded or soldered joint. See Part 3 gate valve schedule articles.
7. Stem: Bronze.
8. Disc: Solid wedge, bronze.
9. Packing: Asbestos free.
10. Handwheel: Malleable iron[, **bronze, or aluminum**].

B. Gate Valves, Threaded or Soldered Ends - Bronze, RS, Class 125:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [NIBCO INC.]
 - h. [Powell Valves]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [WATTS; A Watts Water Technologies Company]

l. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- b. [Crane Fluid Systems; Crane Co.]
- c. [Hammond Valve]
- d. [Jenkins Valves; a Crane Co. brand]
- e. [KITZ Corporation]
- f. [Milwaukee Valve Company]
- g. [NIBCO INC.]
- h. [Powell Valves]
- i. [Red-White Valve Corp.]
- j. [Stockham; a Crane Co. brand]
- k. [WATTS; A Watts Water Technologies Company]
- l. <Insert manufacturer's name>

- 3. Standard: MSS SP-80, Type 2.
- 4. CWP Rating: **200 psig (1380 kPa)**.
- 5. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
- 6. Ends: Threaded or soldered joint. See Part 3 gate valve schedule articles.
- 7. Stem: Bronze.
- 8. Disc: Solid wedge, bronze.
- 9. Packing: Asbestos free.
- 10. Handwheel: Malleable iron, bronze, or aluminum.

C. Gate Valves, Threaded Ends - Bronze, NRS, Class 150:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Valve, Inc]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Crane Fluid Systems; Crane Co.]
- d. [Jenkins Valves; a Crane Co. brand]
- e. [KITZ Corporation]
- f. [Lance Valves]
- g. [Milwaukee Valve Company]
- h. [Powell Valves]
- i. [Red-White Valve Corp.]
- j. [Stockham; a Crane Co. brand]
- k. [WATTS; A Watts Water Technologies Company]
- l. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [American Valve, Inc]
- b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- c. [Crane Fluid Systems; Crane Co.]

- d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Lance Valves]
 - g. [Milwaukee Valve Company]
 - h. [Powell Valves]
 - i. [Red-White Valve Corp.]
 - j. [Stockham; a Crane Co. brand]
 - k. [WATTS; A Watts Water Technologies Company]
 - l. <Insert manufacturer's name>
3. Standard: MSS SP-80, Type 1.
 4. CWP Rating: **300 psig (2070 kPa)**.
 5. Body Material: ASTM B62, bronze with integral seat and union-ring bonnet.
 6. Ends: Threaded.
 7. Stem: Bronze.
 8. Disc: Solid wedge, bronze.
 9. Packing: Asbestos free.
 10. Handwheel: Malleable iron[, **bronze, or aluminum**].
- D. Gate Valves, Threaded Ends - Bronze, RS, Class 150:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [Powell Valves]
 - h. [Stockham; a Crane Co. brand]
 - i. [WATTS; A Watts Water Technologies Company]
 - j. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [Hammond Valve]
 - d. [Jenkins Valves; a Crane Co. brand]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [Powell Valves]
 - h. [Stockham; a Crane Co. brand]
 - i. [WATTS; A Watts Water Technologies Company]
 - j. <Insert manufacturer's name>
 3. Standard: MSS SP-80, Type 2.
 4. CWP Rating: **300 psig (2070 kPa)**.
 5. Body Material: ASTM B62, bronze with integral seat and union-ring bonnet.
 6. Ends: Threaded.

7. Stem: Bronze.
8. Disc: Solid wedge, bronze.
9. Packing: Asbestos free.
10. Handwheel: Malleable iron[, **bronze, or aluminum**].

E. Gate Valves, Flanged Ends - Iron, NRS, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Jenkins Valves; a Crane Co. brand]**
 - h. **[Jomar Valve]**
 - i. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - j. **[KITZ Corporation]**
 - k. **[Lance Valves]**
 - l. **[Legend Valve & Fitting, Inc]**
 - m. **[Powell Valves]**
 - n. **[Zurn Industries, LLC]**
 - o. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Jenkins Valves; a Crane Co. brand]**
 - h. **[Jomar Valve]**
 - i. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - j. **[KITZ Corporation]**
 - k. **[Lance Valves]**
 - l. **[Legend Valve & Fitting, Inc]**
 - m. **[Powell Valves]**
 - n. **[Zurn Industries, LLC]**
 - o. **<Insert manufacturer's name>**
3. Standard: MSS SP-70, Type I.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa)**.
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa)**.
6. Body Material: ASTM A126, gray iron with bolted bonnet.
7. Ends: Flanged.
8. Trim: Bronze.
9. Disc: Solid wedge.

10. Packing and Gasket: Asbestos free.

F. Gate Valves, Flanged Ends - Iron, OS&Y, Class 125:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jomar Valve]**
 - f. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - g. **[KITZ Corporation]**
 - h. **[Lance Valves]**
 - i. **[Legend Valve & Fitting, Inc]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Powell Valves]**
 - l. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - m. **[WATTS; A Watts Water Technologies Company]**
 - n. **[Zurn Industries, LLC]**
 - o. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**
 - e. **[Jomar Valve]**
 - f. **[Kennedy Valve Company; a division of McWane, Inc.]**
 - g. **[KITZ Corporation]**
 - h. **[Lance Valves]**
 - i. **[Legend Valve & Fitting, Inc]**
 - j. **[Milwaukee Valve Company]**
 - k. **[Powell Valves]**
 - l. **[Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]**
 - m. **[WATTS; A Watts Water Technologies Company]**
 - n. **[Zurn Industries, LLC]**
 - o. **<Insert manufacturer's name>**
3. Standard: MSS SP-70, Type I.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **200 psig (1380 kPa).**
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **150 psig (1035 kPa).**
6. Body Material: ASTM A126, gray iron with bolted bonnet.
7. Ends: Flanged.
8. Trim: Bronze.
9. Disc: Solid wedge.
10. Packing and Gasket: Asbestos free.

G. Gate Valves, Flanged Ends - Iron, NRS, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Jenkins Valves; a Crane Co. brand]**
 - h. **[KITZ Corporation]**
 - i. **[Victaulic Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Clow Valve Company; a subsidiary of McWane, Inc.]**
 - c. **[Cooper Valves]**
 - d. **[Crane Fluid Systems; Crane Co.]**
 - e. **[Flomatic Valves; Flomatic Corporation]**
 - f. **[FNW; Ferguson Enterprises, Inc.]**
 - g. **[Jenkins Valves; a Crane Co. brand]**
 - h. **[KITZ Corporation]**
 - i. **[Victaulic Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
3. Standard: MSS SP-70, Type I.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **500 psig (3450 kPa)**.
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa)**.
6. Body Material: ASTM A126, gray iron with bolted bonnet.
7. Ends: Flanged.
8. Trim: Bronze.
9. Disc: Solid wedge.
10. Packing and Gasket: Asbestos free.

H. Gate Valves, Flanged Ends - Iron, OS&Y, Class 250:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Crane Fluid Systems; Crane Co.]**
 - c. **[FNW; Ferguson Enterprises, Inc.]**
 - d. **[Hammond Valve]**

- e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [Powell Valves]
 - h. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - i. [Victaulic Company]
 - j. [WATTS; A Watts Water Technologies Company]
 - k. [Zurn Industries, LLC]
 - l. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Crane Fluid Systems; Crane Co.]
 - c. [FNW; Ferguson Enterprises, Inc.]
 - d. [Hammond Valve]
 - e. [KITZ Corporation]
 - f. [Milwaukee Valve Company]
 - g. [Powell Valves]
 - h. [Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America]
 - i. [Victaulic Company]
 - j. [WATTS; A Watts Water Technologies Company]
 - k. [Zurn Industries, LLC]
 - l. <Insert manufacturer's name>
3. Standard: MSS SP-70, Type I.
4. CWP Rating, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **500 psig (3450 kPa).**
5. CWP Rating, NPS 14 to NPS 24 (DN 350 to DN 600): **300 psig (2070 kPa).**
6. Body Material: ASTM A126, gray iron with bolted bonnet.
7. Ends: Flanged.
8. Trim: Bronze.
9. Disc: Solid wedge.
10. Packing and Gasket: Asbestos free.

2.11 CHAINWHEELS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- 1. [Babbitt Steam Specialty Co]
 - 2. [Roto Hammer Industries; Rotork]
 - 3. [Trumbull Industries]
 - 4. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1. [Babbitt Steam Specialty Co]
 - 2. [Roto Hammer Industries; Rotork]
 - 3. [Trumbull Industries]
 - 4. <Insert manufacturer's name>

- C. Description: Valve actuation assembly with sprocket rim, chain guides, chain[, and attachment brackets for mounting chainwheels directly to handwheels].
 - 1. Sprocket Rim with Chain Guides: [Ductile iron][Ductile or cast iron][Cast iron][Aluminum][Bronze], of type and size required for valve.[Include zinc or epoxy coating.]
 - 2. Chain: [Hot-dip, galvanized steel][Brass][Stainless steel], of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Examine press fittings to verify they have been properly pressed.
- F. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Provide support of piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access and where not blocked by equipment, other piping, or building components.
- D. For valves in horizontal piping, install valves with stem at or above center of pipe.
- E. Install valves in position that does not project into aisles or block access to other equipment.
- F. Install valves in position to allow full stem and actuator or manual operator movement.
- G. Verify that joints of each valve have been properly installed and sealed to assure there is no leakage or damage.
- H. Chainwheels: Install chainwheels on manual operators for [butterfly][globe][and][gate] valves [NPS 4 (DN 100)]<Insert pipe size> and larger and more than [96 inches (2400 mm)]<Insert dimension> above floor. Extend chains to [60 inches (1520 mm)]<Insert dimension> above finished floor.
- I. Install check valves for proper direction of flow and as follows:

1. Check Valves: **[Center-guided type][and][plate type]**, in horizontal or vertical position, between flanges.
 2. Check Valves, Swing Type: In horizontal position with hinge pin level.
 3. Check Valves, Lift Type: With stem upright and plumb.
- J. Valve Tags: Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
- K. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's written recommended maximum.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
 7. For Stainless Steel Piping, NPS 2 (DN 50) and Smaller: **[Threaded][Press]** ends.
 8. For Stainless Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
 9. For Grooved-End Copper Tubing: Valve ends may be grooved.
 10. For Grooved-End Steel Piping: Valve ends may be grooved.
 11. Wafer-Type Valves: Flanged connections.

3.5 LOW-PRESSURE, COMPRESSED-AIR BALL VALVE SCHEDULE - 150 PSIG (1035 kPa) OR LESS

- A. Pipe NPS 2 (DN 50) and Smaller:
1. Ball valves, threaded or soldered ends - brass, three piece with full port and brass trim; **[threaded][soldered]** ends.
 2. Ball valves, threaded or soldered ends - brass, three piece with full port and stainless steel trim; **[threaded][soldered]** ends.
 3. Ball valves, threaded or soldered ends - brass, two piece with full port and brass trim; **[threaded][soldered]** ends.
 4. Ball valves, threaded or soldered ends - brass, two piece with full port and stainless steel trim; **[threaded][soldered]** ends.
 5. Ball valves, threaded or flanged ends - stainless steel, two piece with full port; **[threaded][flanged]** ends.

6. Ball valves, threaded ends - bronze, two piece, safety exhaust; [200 psig (1380 kPa)]<Insert pressure>.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Ball valves, flanged ends - steel, with full port and stainless steel trim, Class 150.
2. Ball valves, flanged ends - steel, with full port and stainless steel trim, Class 300.
3. Ball valves, flanged ends - iron, Class 125.
4. Ball valves, threaded or flanged ends - stainless steel, two piece with full port; [threaded][flanged] ends.

3.6 HIGH-PRESSURE, COMPRESSED-AIR BALL VALVE SCHEDULE - 150 TO 200 PSIG (1035 TO 1380 kPa)

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball valves, threaded or soldered ends - brass, three piece with full port and brass trim; [threaded][soldered] ends.
2. Ball valves, threaded or soldered ends - brass, three piece with full port and stainless steel trim; [threaded][soldered] ends.
3. Ball valves, threaded or soldered ends - brass, two piece with full port and brass trim; [threaded][soldered] ends.
4. Ball valves, threaded or soldered ends - brass, two piece with full port and stainless steel trim; [threaded][soldered] ends.
5. Ball valves, threaded or flanged ends - stainless steel, two piece with full port; [threaded][flanged] ends.
6. Ball valves, threaded ends - bronze, two piece, safety exhaust; [200 psig (1380 kPa)]<Insert pressure>.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Ball valves, flanged ends - steel, with full port and stainless steel trim, Class 150.
2. Ball valves, flanged ends - steel, with full port and stainless steel trim, Class 300.
3. Ball valves, flanged ends - iron, Class 125.
4. Ball valves, threaded or flanged ends - stainless steel, two piece with full port; [threaded][flanged] ends.

3.7 DOMESTIC HOT- AND COLD-WATER BALL VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball valves, lead free, threaded ends - brass, one piece.
2. Ball valves, lead free, threaded or soldered ends - brass, two piece with full port and brass trim; [threaded][soldered] ends.
3. Ball valves, lead free, threaded or soldered ends - brass, two piece with full port and stainless steel trim; [threaded][soldered] ends.
4. Ball valves, lead free, threaded or soldered ends - brass, two piece with regular port and brass trim; [threaded][soldered] ends.
5. Ball valves, lead free, threaded or soldered ends - brass, two piece with regular port and stainless steel trim; [threaded][soldered] ends.
6. Ball valves, lead free, threaded or soldered ends - brass, three piece with full port and brass trim; [threaded][soldered] ends.
7. Ball valves, lead free, threaded or soldered ends - brass, three piece with full port and stainless

- steel trim; **[threaded][soldered]** ends.
8. Ball valves, lead free, threaded ends - bronze, one piece with bronze trim.
 9. Ball valves, lead free, threaded ends - bronze, one piece with stainless steel trim.
 10. Ball valves, lead free, threaded or soldered ends - bronze, two piece with full port and bronze or brass trim; **[threaded][soldered]** ends.
 11. Ball valves, lead free, threaded or soldered ends - bronze, two piece with full port and stainless steel trim; **[threaded][soldered]** ends.
 12. Ball valves, lead free, threaded ends - bronze, two piece with regular port and bronze or brass trim.
 13. Ball valves, lead free, threaded ends - bronze, two piece with regular port and stainless steel trim.
 14. Ball valves, lead free, threaded ends - bronze, three piece with full port and bronze or brass trim.
 15. Ball valves, lead free, threaded ends - bronze, three piece with full port and stainless steel trim.
 16. Ball valves, lead free, threaded or soldered ends - bronze, three piece with regular port and bronze or brass trim; **[threaded][soldered]** ends.
 17. Ball valves, lead free, threaded or soldered ends - bronze, three piece with regular port and stainless steel trim; **[threaded][soldered]** ends.
 18. Ball valves, lead free, threaded or flanged ends - stainless steel, two piece with full port; **[threaded][flanged]** ends.
 19. Ball valves, lead free, press ends - brass, two piece with full port and brass trim.
 20. Ball valves, lead free, press ends - brass, two piece with full port and stainless steel trim.
 21. Ball valves, lead free, press ends - bronze, two piece with full port and bronze or brass trim.
 22. Ball valves, lead free, press ends - stainless steel, two piece with full port.
 23. Ball valves, lead free, flanged or threaded ends - steel, with full port, Class 150; **[threaded][flanged]** ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Ball valves, lead free, flanged or threaded ends - iron, Class 125; **[flanged][threaded]** ends.
2. Ball valves, lead free, flanged or threaded ends - steel, with full port, Class 150; **[flanged][threaded]** ends.
3. Ball valves, lead free, flanged or threaded ends - steel, with regular port, Class 150; **[flanged][threaded]** ends.
4. Ball valves, threaded or flanged ends - stainless steel, two piece with full port; **[threaded][flanged]** ends.

C. For CPVC Pipe:

1. CPVC Union-Type Ball Check Valve: **[NPS 2 (DN 50) and smaller][NPS 4 (DN 100) and smaller][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert pressure>** at **[73 deg F (23 deg C)]<Insert temperature>**.
 - a. End Connections for Valves NPS 2 (DN 50) and Smaller: **[Socket][or][threaded]**.
 - b. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): **[Socket][Socket or threaded][Threaded][Flanged]**.

D. For PVC Pipe:

1. PVC Union-Type Ball Check Valve: **[NPS 2 (DN 50) and smaller][NPS 4 (DN 100) and smaller][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert pressure>** at **[73 deg F (23 deg C)]<Insert temperature>**.
 - a. End Connections for Valves NPS 2 (DN 50) and Smaller: **[Socket][or][threaded]**.
 - b. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): **[Socket][Socket or threaded][Threaded][Flanged]**.

3.8 LOW-PRESSURE, COMPRESSED-AIR BUTTERFLY VALVE SCHEDULE - 150 PSIG (1035 kPa) OR LESS**A. Pipe NPS 2-1/2 (DN 65) and Larger:**

1. Butterfly valves, single flange (lug type) - iron, with aluminum-bronze disc; **[150][200]** CWP, NBR seat.
2. Butterfly valves, single flange (lug type) - iron, with ductile-iron disc; **[150][200]** CWP, NBR seat.
3. Butterfly valves, single flange (lug type) - iron, with stainless steel disc; **[150][200]** CWP, NBR seat.
4. Butterfly valves, flangeless (wafer type) - iron, with aluminum-bronze disc; **[150][200]** CWP, NBR seat.
5. Butterfly valves, flangeless (wafer type) - iron, with ductile-iron disc; **[150][200]** CWP, NBR seat.
6. Butterfly valves, flangeless (wafer type) - iron, with stainless steel disc; **[150][200]** CWP, NBR seat.
7. Butterfly valves, grooved end - ductile iron, 175 CWP; NBR seat.
8. Butterfly valves, grooved end - ductile iron, 300 CWP; NBR seat.
9. Butterfly valves, grooved end - stainless steel; NBR seat.

3.9 HIGH-PRESSURE, COMPRESSED-AIR BUTTERFLY VALVE SCHEDULE - 150 TO 200 PSIG (1035 TO 1380 kPa)**A. Pipe NPS 2-1/2 (DN 65) and Larger:**

1. Butterfly valves, single flange (lug type) - iron, with aluminum-bronze disc; 200 CWP, NBR seat.
2. Butterfly valves, single flange (lug type) - iron, with ductile-iron disc; 200 CWP, NBR seat.
3. Butterfly valves, single flange (lug type) - iron, with stainless steel disc; 200 CWP, NBR seat.
4. Butterfly valves, flangeless (wafer type) - iron, with aluminum-bronze disc; 200 CWP, NBR seat.
5. Butterfly valves, flangeless (wafer type) - iron, with ductile-iron disc; 200 CWP, NBR seat.
6. Butterfly valves, flangeless (wafer type) - iron, with stainless steel disc; 200 CWP, NBR seat.
7. Butterfly valves, grooved end - ductile iron, 175 CWP; NBR seat.
8. Butterfly valves, grooved end - ductile iron, 300 CWP; NBR seat.
9. Butterfly valves, grooved end - stainless steel; NBR seat.

3.10 DOMESTIC HOT- AND COLD-WATER BUTTERFLY VALVE SCHEDULE**A. Pipe NPS 2-1/2 (DN 65) and Larger:**

1. Butterfly valves, lead free, single flange (lug type) - iron, with aluminum-bronze disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
2. Butterfly valves, lead free, single flange (lug type) - iron, with ductile-iron disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
3. Butterfly valves, lead free, single flange (lug type) - iron, with stainless steel disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
4. Butterfly valves, lead free, flangeless (wafer type) - iron, with aluminum-bronze disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
5. Butterfly valves, lead free, flangeless (wafer type) - iron, with ductile-iron disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
6. Butterfly valves, lead free, flangeless (wafer type) - iron, with stainless steel disc; **[150][200]** CWP, **[EPDM][NBR]** seat.
7. Butterfly valves, lead free, grooved end - ductile iron, 175 CWP; **[EPDM][NBR]** seat.
8. Butterfly valves, lead free, grooved end - ductile iron, 300 CWP; **[EPDM][NBR]** seat.

- B. For CPVC Pipe: CPVC butterfly valve for [NPS 2-1/2 (DN 65)][NPS 5 (DN 125)] and larger.
- C. For PVC Pipe: PVC butterfly valve for [NPS 2-1/2 (DN 65)][NPS 5 (DN 125)] and larger.
- D. For Stainless Steel Pipe: Stainless steel, grooved-end butterfly valve for NPS 2-1/2 (DN 65) and larger.

3.11 LOW-PRESSURE, COMPRESSED-AIR CHECK VALVE SCHEDULE - 150 PSIG (1035 kPa) OR LESS

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Vertical, Upflow Applications Only:
 - a. Check valves, lift type, threaded or soldered ends - bronze, with bronze disc, Class 125; [threaded][soldered] ends.
 - b. Check valves, lift type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; [threaded][soldered] ends.
 - 2. Horizontal and Vertical Applications:
 - a. Check valves, swing type, threaded or soldered ends - bronze, with bronze disc, Class 125; [threaded][soldered] ends.
 - b. Check valves, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; [threaded][soldered] ends.
 - c. Check valves, swing type, threaded or soldered ends - bronze, with bronze disc, Class 150; [threaded][soldered] ends.
 - d. Check valves, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 150; [threaded][soldered] ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Check valves, swing type, flanged ends - iron, with metal seats, Class 125.
 - 2. Check valves, swing type, flanged ends - iron, with nonmetallic-to-metal seats, Class 125.
 - 3. Check valves, swing type, flanged ends - iron, with metal seats, Class 250.
 - 4. Check valves, swing type, grooved ends - iron, 300 CWP.
 - 5. Check valves, dual-plate type - iron, with metal seat, Class 125.
 - 6. Check valves, dual-plate type - iron, with metal seat, Class 150.
 - 7. Check valves, dual-plate type - iron, with metal seat, Class 250.
 - 8. Check valves, dual-plate type - iron, with metal seat, Class 300.
 - 9. Check valves, dual-plate type - iron, with resilient seat, Class 125.
 - 10. Check valves, dual-plate type - iron, with resilient seat, Class 150.
 - 11. Check valves, dual-plate type - iron, with resilient seat, Class 250.
 - 12. Check valves, dual-plate type - iron, with resilient seat, Class 300.
 - 13. Check valves, single-plate type - iron, with resilient seat, Class 125; NBR seat.
 - 14. Check valves, single-plate type - iron, with resilient seat, Class 250; NBR seat.

3.12 HIGH-PRESSURE, COMPRESSED-AIR CHECK VALVE SCHEDULE - 150 TO 200 PSIG (1035 TO 1380 kPa)

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Vertical, Upflow Applications Only:
 - a. Check valves, lift type, threaded or soldered ends - bronze, with bronze disc, Class 125; [threaded][soldered] ends.

- b. Check valves, lift type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; **[threaded][soldered]** ends.

2. Horizontal and Vertical Applications:

- a. Check valves, swing type, threaded or soldered ends - bronze, with bronze disc, Class 125; **[threaded][soldered]** ends.
- b. Check valves, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; **[threaded][soldered]** ends.
- c. Check valves, swing type, threaded or soldered ends - bronze, with bronze disc, Class 150; **[threaded][soldered]** ends.
- d. Check valves, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 150; **[threaded][soldered]** ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

- 1. Check valves, swing type, flanged ends - iron, with metal seats, Class 125.
- 2. Check valves, swing type, flanged ends - iron, with nonmetallic-to-metal seats, Class 125.
- 3. Check valves, swing type, flanged ends - iron, with metal seats, Class 250.
- 4. Check valves, swing type, grooved ends - iron, 300 CWP.
- 5. Check valves, dual-plate type - iron, with metal seat, Class 125.
- 6. Check valves, dual-plate type - iron, with metal seat, Class 150.
- 7. Check valves, dual-plate type - iron, with metal seat, Class 250.
- 8. Check valves, dual-plate type - iron, with metal seat, Class 300.
- 9. Check valves, dual-plate type - iron, with resilient seat, Class 125.
- 10. Check valves, dual-plate type - iron, with resilient seat, Class 150.
- 11. Check valves, dual-plate type - iron, with resilient seat, Class 250.
- 12. Check valves, dual-plate type - iron, with resilient seat, Class 300.
- 13. Check valves, single-plate type - iron, with resilient seat, Class 125; NBR seat.
- 14. Check valves, single-plate type - iron, with resilient seat, Class 250; NBR seat.

3.13 DOMESTIC HOT- AND COLD-WATER CHECK VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

- 1. Check valves, lead free, swing type, threaded or soldered ends - bronze, with bronze disc, Class 125; **[threaded][soldered]** ends.
- 2. Check valves, lead free, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; **[threaded][soldered]** ends.
- 3. Check valves, lead free, swing type, threaded or soldered ends - bronze, with bronze disc, Class 150; **[threaded][soldered]** ends.
- 4. Check valves, lead free, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 150; **[threaded][soldered]** ends.
- 5. Check valves, lead free, swing type, press ends - bronze.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

- 1. Check valves, lead free, swing type, flanged or threaded ends - iron, with metal seats, Class 125; **[flanged][threaded]** ends.
- 2. Check valves, lead free, swing type, flanged or threaded ends - iron, with nonmetallic-to-metal Seats, Class 125; **[flanged][threaded]** ends.
- 3. Check valves, lead free, swing type, flanged or threaded ends - iron, with metal seats, Class 250; **[flanged][threaded]** ends.
- 4. Check valves, lead free, swing type, flanged or threaded ends - iron, with lever- and spring-

- closure control, Class 125; **[flanged][threaded]** ends.
 5. Check valves, lead free, swing type, flanged or threaded ends - iron, with lever- and weight-closure control, Class 125; **[flanged][threaded]** ends.
 6. Check valves, lead free, swing type, grooved ends - iron, 300 CWP.
 7. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 125.
 8. Check valves, lead free, center guided - iron, globe, with metal seat, Class 125.
 9. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 150.
 10. Check valves, lead free, center guided - iron, globe, with metal seat, Class 150.
 11. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 250.
 12. Check valves, lead free, center guided - iron, globe, with metal seat, Class 250.
 13. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 300.
 14. Check valves, lead free, center guided - iron, globe, with metal seat, Class 300.
 15. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
 16. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
 17. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 150; **[EPDM][or][NBR]** seat.
 18. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 150; **[EPDM][or][NBR]** seat.
 19. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
 20. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
 21. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 300; **[EPDM][or][NBR]** seat.
 22. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 300; **[EPDM][or][NBR]** seat.
 23. Check valves, lead free, dual-plate type - iron, with metal seat, Class 125.
 24. Check valves, lead free, dual-plate type - iron, with metal seat, Class 150.
 25. Check valves, lead free, dual-plate type - iron, with metal seat, Class 250.
 26. Check valves, lead free, dual-plate type - iron, with metal seat, Class 300.
 27. Check valves, lead free, single-plate type - iron, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
 28. Check valves, lead free, dual-plate type - iron, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
 29. Check valves, lead free, dual-plate type - iron, with resilient seat, Class 150; **[EPDM][or][NBR]** seat.
 30. Check valves, lead free, single-plate type - iron, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
 31. Check valves, lead free, dual-plate type - iron, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
 32. Check valves, lead free, dual-plate type - iron, with resilient seat, Class 300; **[EPDM][or][NBR]** seat.
- C. For CPVC Pipe:
1. NPS 2 (DN 50) and Smaller: **[Union][Non-union]** ball valve.
 2. NPS 4 (DN 100) and Smaller: **[Union][Non-union]** ball valve.
- D. For PVC Pipe:
1. NPS 2 (DN 50) and Smaller: **[Union][Non-union]** ball valve.
 2. NPS 4 (DN 100) and Smaller: **[Union][Non-union]** ball valve.

3.14 PUMP-DISCHARGE CHECK VALVE SCHEDULE**A. Pipe NPS 2 (DN 50) and Smaller:**

1. Check valves, lead free, swing type, threaded or soldered ends - bronze, with bronze disc, Class 125; **[threaded][soldered]** ends.
2. Check valves, lead free, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; **[threaded][soldered]** ends.
3. Check valves, lead free, swing type, threaded or soldered ends - bronze, with bronze disc, Class 150; **[threaded][soldered]** ends.
4. Check valves, lead free, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 150; **[threaded][soldered]** ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger for Domestic Water Pumps:

1. Check valves, lead free, swing type, flanged or threaded ends - iron, with lever- and spring-closure control, Class 125; **[flanged][threaded]** ends.
2. Check valves, lead free, swing type, flanged or threaded ends - iron, with lever- and weight-closure control, Class 125; **[flanged][threaded]** ends.
3. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 125.
4. Check valves, lead free, center guided - iron, globe, with metal seat, Class 125.
5. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 150.
6. Check valves, lead free, center guided - iron, globe, with metal seat, Class 150.
7. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 250.
8. Check valves, lead free, center guided - iron, globe, with metal seat, Class 250.
9. Check valves, lead free, center guided - iron, compact wafer, with metal seat, Class 300.
10. Check valves, lead free, center guided - iron, globe, with metal seat, Class 300.
11. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
12. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 125; **[EPDM][or][NBR]** seat.
13. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 150; **[EPDM][or][NBR]** seat.
14. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 150; **[EPDM][or][NBR]** seat.
15. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
16. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 250; **[EPDM][or][NBR]** seat.
17. Check valves, lead free, center guided - iron, compact wafer, with resilient seat, Class 300; **[EPDM][or][NBR]** seat.
18. Check valves, lead free, center guided - iron, globe, with resilient seat, Class 300; **[EPDM][or][NBR]** seat.

C. Pipe NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage:

1. Check valves, swing type, flanged ends - iron, with lever- and spring-closure control, Class 125.
2. Check valves, swing type, flanged ends - iron, with lever- and weight-closure control, Class 125.

3.15 LOW-PRESSURE, COMPRESSED-AIR GATE VALVE SCHEDULE - 150 PSIG (1035 kPa) OR LESS**A. Pipe NPS 2 (DN 50) and Smaller:**

1. Gate valves, threaded or soldered ends - bronze, NRS, Class 125; **[threaded][soldered]** ends.

2. Gate valves, threaded or soldered ends - bronze, RS, Class 125; [threaded][soldered] ends.
3. Gate valves, threaded ends - bronze, NRS, Class 150.
4. Gate valves, threaded ends - bronze, RS, Class 150.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Gate valves, flanged ends - iron, NRS, Class 125.
2. Gate valves, flanged ends - iron, OS&Y, Class 125.
3. Gate valves, flanged ends - iron, NRS, Class 250.
4. Gate valves, flanged ends - iron, OS&Y, Class 250.

3.16 HIGH-PRESSURE, COMPRESSED-AIR GATE VALVE SCHEDULE - 150 TO 200 PSIG (1035 TO 1380 kPa)

A. Pipe NPS 2 (DN 50) and Smaller:

1. Gate valves, threaded or soldered ends - bronze, NRS, Class 125; [threaded][or][soldered] ends.
2. Gate valves, threaded or soldered ends - bronze, RS, Class 125; [threaded][or][soldered] ends.
3. Gate valves, threaded ends - bronze, NRS, Class 150.
4. Gate valves, threaded ends - bronze, RS, Class 150.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Gate valves, flanged ends - iron, NRS, Class 125.
2. Gate valves, flanged ends - iron, OS&Y, Class 125.
3. Gate valves, flanged ends - iron, NRS, Class 250.
4. Gate valves, flanged ends - iron, OS&Y, Class 250.

3.17 DOMESTIC HOT- AND COLD-WATER GATE VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Gate valves, lead free, threaded or soldered ends - bronze, NRS, Class 125; [threaded][or][soldered] ends.
2. Gate valves, lead free, threaded or soldered ends - bronze, RS, Class 125; [threaded][or][soldered] ends.
3. Gate valves, lead free, threaded ends - bronze, NRS, Class 150.
4. Gate valves, lead free, threaded ends - bronze, RS, Class 150.
5. Gate valves, lead free, press ends - bronze.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Gate valves, lead free, flanged ends - iron, NRS, Class 125.
2. Gate valves, lead free, flanged ends - iron, OS&Y, Class 125.
3. Gate valves, lead free, flanged ends - iron, NRS, Class 250.
4. Gate valves, lead free, flanged ends - iron, OS&Y, Class 250.

C. For CPVC Pipe:

1. NPS 2 (DN 50) and Smaller: [Union][Non-union] gate valve.
2. NPS 4 (DN 100) and Smaller: [Union][Non-union] gate valve.



D. For PVC Pipe:

1. NPS 2 (DN 50) and Smaller: [**Union**][**Non-union**] gate valve.
2. NPS 4 (DN 100) and Smaller: [**Union**][**Non-union**] gate valve.

END OF SECTION 22 05 23 00



Task	Specification	Specification Description
22 05 23 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing
22 05 23 00	23 05 23 00	General-Duty Valves for HVAC Piping



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SECTION 22 05 29 00 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports - metal.
2. Pipe hangers - metal, trapeze type.
3. Pipe hangers - FRP.
4. Strut support system - metal, rod type.
5. Strut support system - metal, cable type.
6. Strut support systems - FRP.
7. Thermal hanger shield inserts.
8. Fastener systems.
9. Pipe-positioning systems.
10. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220500 "Common Work Results for Plumbing" for pipe guides and anchors.
3. **[Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"]**
[Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment"] for vibration isolation devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: **[Signed and sealed by a qualified professional engineer.]** Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal strut support systems.
3. Rooftop-mounted strut support systems.
4. FRP strut support systems.
5. Pipe stands.
6. Equipment supports.

C. Delegated Design Submittals: For **[trapeze hangers]** **[and]** **[strut support systems]** indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication/assembly and design calculations for **[trapeze hangers]** **[strut support systems]**.
2. Detail fabrication/assembly and design calculations for each type of strut support system, by the manufacturer's technical representative.

D. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for recycled content.>

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design **[trapeze hangers]** [, **strut support systems,**] **[and]** equipment supports.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment are to withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with **[ASCE/SEI 7]** **<Insert requirement>**.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment **[and obtain approval from authorities having jurisdiction]**.

2.2 PIPE HANGERS AND SUPPORTS - METAL

- A. Pipe Hangers and Supports - Carbon Steel:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
3. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
4. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
5. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[carbon steel]** **[stainless steel]** **<Insert material>**.

- B. Pipe Hangers and Supports - Stainless Steel:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
3. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[stainless steel]** **<Insert material>**.

C. Pipe/Tube Hangers and Supports - Copper:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: MSS SP-58, Types 1 through 58, copper-plated-steel, factory-fabricated components.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[copper-plated steel]** **[stainless steel]** **<Insert material>**.

2.3 PIPE HANGERS - METAL, TRAPEZE TYPE

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 PIPE HANGERS - FRP

A. Pipe Hangers - FRP, Clevis Type:

1. Description: Similar to MSS SP-58, Type 1 factory-fabricated steel pipe hanger, except hanger is made of fiberglass-reinforced plastic resin.
2. Hanger Rods: Continuous-thread **[stainless steel]** **<Insert material>** rod, washer, and nuts made of **[FRP]** **[polyurethane]** **[or]** **[stainless steel]** **<Insert material>**.
3. Flammability: ASTM D635, ASTM E84, UL 94.

B. Pipe Hangers - FRP, Strap Type:

1. Description: Similar to MSS SP-58, Type 9 or Type 10 steel pipe hanger, except hanger is made of fiberglass-reinforced plastic resin.
 - a. Flammability: ASTM D635, ASTM E84, UL 94.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of **[stainless steel]** **<Insert material>**.

2.5 STRUT SUPPORT SYSTEMS - METAL

A. Strut Support System - Metal, Rod Type:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Factory-fabricated pipe-support assembly, made of steel channels, vertical metal support rods, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Struts: Continuous slotted **[carbon-steel]** **[stainless steel, Type 304]** **[stainless steel, Type 316]** **[extruded-aluminum]** **<Insert material>** **[channel with inturned lips]** **[or]** **[angle]** **<Insert strut type>**.
5. Strut Width: Selected for applicable load criteria.

6. Strut Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of **[carbon steel] [stainless steel] <Insert material>**.
8. Metallic Coating: **[Plain] [Pregalvanized G90 (Z275)] [Electroplated zinc] [Hot-dip galvanized] [Gold (yellow zinc dichromate) galvanized]**.
9. Paint Coating: **[Green epoxy, acrylic, or urethane] <Insert paint type>**.
10. Plastic Coating: **[PVC] <Insert plastic type>**.
11. Combination Coating: **<Insert combination coating>**.

B. Strut Support System - Metal, Cable Type:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: Factory-fabricated pipe-support system, consisting of cable pipe clamps and associated vibration isolation rubber pads, slotted channel brackets, wire rope suspension components, and associated accessories for a complete piping suspension system; no tools required for manual assembly in the field to support multiple parallel pipe routing.
3. Standards:
 - a. ICC-ES PMG Product Certificate.
 - b. Brackets: Fire-rated, tested to F120 in accordance with BS EN 1363-1:2020.
4. Components:
 - a. Pipe Clamps: Size-adjustable **[standard] [compact] [and] [field-height-adjustable]** clamps with **[rubber pad, 14 dBa noise reduction] [and] [large rubber pad, 18 dBa noise reduction] [acoustic rubber pad, 23 dBa noise reduction]**; with sleeve to prevent galvanic corrosion.
 - b. Brackets: Slotted channels furnished in pre-cut lengths to suit specific system application for Project **<Insert type of coating>**.
 - c. Suspension Components: Hanging cables with adjustable fastener; can be pre-installed on the brackets using pre-fitted washer/nuts or retention clips.
 - 1) Wire Rope: High tensile steel wire rope, complying with ASTM A1023/A1023M, ASTM A641/A641M Class A zinc coating; **[7 by 7] [and] [7 by 19]** cross-sectional construction; having a tensile strength of 256,000 psi (1,770 N per sq mm); lengths, diameters, and wire construction **[to accommodate design loads] [indicated on Shop Drawings]**.
 - a) Locking screw/release button.
 - b) Foot attachment type to suit application.
 - c) End Fix Type: **[Loop] [, strap hook] [, eyelet] [or] <Insert type> <as required to suit application>**.
 - d. Adjustable Fastener: Mild steel (type EN1A), bright zinc plated, one-channel body; encasing a series of Type 302 stainless steel springs with serrated self-locking Grade 40 chrome steel balls, adjustable by means of an integrated mechanism, capable of accommodating load of **[100 lb (45 kg)] [200 lb (90 kg)] [500 lb (225 kg)]**.

2.6 STRUT SUPPORT SYSTEMS - FRP

A. Strut Support System - FRP:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Structural-grade, factory-formed, glass-fiber-resin channels and angles for supporting multiple parallel pipes.
 - a. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
 - b. Struts: Continuous slotted fiberglass-reinforced plastic channel with inturned lips.
 - c. Strut Width: Selected for applicable load criteria.
 - d. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 - e. Fitting and Accessory Materials: Same as those for channels and angles[, **except metal items may be stainless steel**].
 - f. Rated Strength: Selected to suit applicable load criteria.
 - g. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 THERMAL HANGER SHIELD INSERTS

A. Thermal Hanger Shield Inserts:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Insulation-Insert Material for Cold Piping: [**ASTM C552, Type II cellular glass with 100 psig (688 kPa)**] [or] [**ASTM C591, Type VI, Grade 1 polyisocyanurate with 125 psig (862 kPa)**] minimum compressive strength and vapor barrier.
3. Insulation-Insert Material for Hot Piping: [**Water-repellent-treated, ASTM C533, Type I calcium silicate with 100 psig (688 kPa)**] [**ASTM C552, Type II cellular glass with 100 psig (688 kPa)**] [or] [**ASTM C591, Type VI, Grade 1 polyisocyanurate with 125 psig (862 kPa)**] minimum compressive strength.
4. For Trapeze or Clamped Systems: Insert and shield are to cover entire circumference of pipe.
5. For Clevis or Band Hangers: Insert and shield are to cover bottom 180 degrees of pipe.
6. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 FASTENER SYSTEMS

A. Fastener System - Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities required for supported loads and building materials where used.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

B. Fastener System - Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities required for supported loads and building materials where used.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Indoor Applications: [**Zinc-plated**] [or] [**stainless**] steel.
3. Outdoor Applications: Stainless steel.

2.9 PIPE-POSITIONING SYSTEMS

A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.10 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.11 MATERIALS

- A. Aluminum: ASTM B221 (ASTM B221M).
- B. Carbon Steel: ASTM A1011/A1011M.
- C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000 psi (34.5 MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination is to include weight of supported components plus **[200 lb (90 kg)]** **<Insert value>**.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- B. Install lateral bracing with pipe hangers and supports to prevent swaying.
- C. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **[NPS 2-1/2 (DN 65)]** **<Insert pipe size>** and larger **[and at changes in direction of piping]**. Coordinate location of concrete inserts before concrete is placed.

- D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- F. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Thermal hanger shield inserts may be used as an option. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields are to span an arc of 180 degrees.
 - a. Thermal hanger shield inserts may be used as an option. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
 - 5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- G. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- H. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate in accordance with ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel in accordance with AWS D1.1/D1.1M.
- I. FRP Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.



- J. Strut System Installation: **[Metal, rod type] [Metal, cable type] [FRP]**; arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems. Install in accordance with manufacturer's written installation instructions.
- K. Thermal Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- L. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick after concrete is placed and cured. Use installers that are licensed by powder-actuated tool manufacturer.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners in accordance with manufacturer's written instructions.
 - 3. Install lag screw wood fasteners in accordance with manufacturer's written instructions.
 - 4. Install fasteners in accordance with manufacturer's written instructions.
- M. Pipe Stand Installation:
 - 1. Pipe Stand Types, except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- N. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- O. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- P. Equipment Support Installation:
 - 1. Fabricate from welded-structural-steel shapes.
 - 2. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
 - 3. Grouting: Place grout under supports for floor-mounted equipment, and make bearing surface smooth.
 - 4. Provide lateral bracing, to prevent swaying.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for **[trapeze pipe hangers] [and] [equipment supports]**.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to **[1-1/2 inches (40 mm)] <Insert dimension>**.

3.5 PAINTING

- A. Touchup:
 1. Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
 2. Comply with requirements in **[Section 099113 "Exterior Painting"] [Section 099123 "Interior Painting"] [Section 099600 "High-Performance Coatings"] <Insert painting Section(s)>** for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
 3. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel **[pipe hangers and supports] [metal trapeze pipe hangers] [and] [metal framing systems]** and attachments for general service applications.
- F. Use **[stainless steel pipe hangers] [FRP pipe hangers] [and] [FRP strut systems] and [stainless steel] [or] [corrosion-resistant]** attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and **[copper] [or] [stainless steel]** attachments for copper piping and tubing.

- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C) pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction occurs.
 - 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction occurs.
 - 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
 - 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
 - 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:



1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Use **[powder-actuated fasteners]** **[or]** **[mechanical-expansion anchors]** instead of building attachments where required in concrete construction.
- R. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29 00



Task	Specification	Specification Description
22 05 29 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 33 00 - HEAT TRACING FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes heat tracing of plumbing piping for freeze prevention **[and, domestic hot-water-temperature maintenance]** with self-regulating, parallel-resistance electric heating cables:
- B. Related Requirements:
 - 1. Section 210533 "Heat Tracing for Fire-Suppression Piping."
 - 2. Section 230533 "Heat Tracing for HVAC Piping."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
 - 2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
- B. Shop Drawings: For electric heating cable.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric heating cables and controls to include in operation and maintenance manuals.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **[Three][Five][10]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES**

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. **[BriskHeat]**
2. **[Chromalox, Inc.]**
3. **[Delta-Therm Corporation]**
4. **[EasyHeat; Emerson Electric Co., Commercial and Residential Solutions]**
5. **[Nelson; Emerson Electric Co., Automation Solutions]**
6. **[RAYCHEM; brand of nVent Electrical plc]**
7. **[Thermon, Inc.]**
8. **[Trasor Corp.]**
9. **[WarmlyYours Radiant, Inc.]**
10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[BriskHeat]**
2. **[Chromalox, Inc.]**
3. **[Delta-Therm Corporation]**
4. **[EasyHeat; Emerson Electric Co., Commercial and Residential Solutions]**
5. **[Nelson; Emerson Electric Co., Automation Solutions]**
6. **[RAYCHEM; brand of nVent Electrical plc]**
7. **[Thermon, Inc.]**
8. **[Trasor Corp.]**
9. **[WarmlyYours Radiant, Inc.]**
10. **<Insert manufacturer's name>**

- C. Source Limitations: Obtain all heat tracing from one manufacturer.

- D. Standard: IEEE 515.1.

- E. Heating Element: Pair of parallel **[No. 16][No. 18]** AWG, **[tinned][nickel-coated]**, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length.

- F. Electrical Insulating Jacket: Flame-retardant polyolefin.

- G. Grounding Cover: **[Copper][Tinned-copper]** braid.

- H. Cable Cover: Polyolefin outer jacket with ultraviolet inhibitor.

- I. Terminate cable with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable is to be capable of crossing over itself once without overheating.

- J. Maximum Operating Temperature (Power On): **[150 deg F (65 deg C)]<Insert temperature>**.

- K. Maximum Exposure Temperature (Power Off): **[185 deg F (85 deg C)]<Insert temperature>**.

L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency, and marked for intended location and application.

M. Capacities and Characteristics:

1. Maximum Heat Output: [3 W/ft. (9.8 W/m)][5 W/ft. (16.4 W/m)][8 W/ft. (26 W/m)][10 W/ft. (32.8 W/m)][12 W/ft. (39.4 W/m)]<Insert value>.
2. Piping Diameter: <Insert NPS (DN)>.
3. Number of Parallel Cables: <Insert number>.
4. Spiral Wrap Pitch: <Insert inches (mm)>.
5. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: [120][208][240][277][480]<Insert number> V.
 - b. Phase: <Insert value>.
 - c. Hertz: <Insert number> Hz.
 - d. Full-Load Amperes: <Insert number> A.
 - e. Minimum Circuit Ampacity: <Insert number> A.
 - f. Maximum Overcurrent Protection: <Insert number> A.

2.2 CONTROLS

A. Pipe-Mounted Thermostats for Freeze Protection:

1. Remote bulb temperature control unit with adjustable range from [30 to 50 deg F (minus 1 to plus 10 deg C)]<Insert temperature range>.
2. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
3. Remote temperature-sensing bulb on capillary, resistance temperature device, or thermistor for directly sensing outside air or pipe-wall temperature.
4. Corrosion-resistant, waterproof control enclosure.

B. Control Panel:

1. [Microprocessor-based][Automatic] control with manual on, automatic, and standby/reset switch.
2. Remote temperature sensor senses outside air temperature; programmable to energize the freeze-protection cable when temperature falls below [34 to 44 deg F (1 to 7 deg C)]<Insert temperature range>.
3. Remote temperature sensor senses domestic hot water temperature; programmable to control the domestic hot water temperature at [110 to 120 deg F (47 to 53 deg C)]<Insert temperature range>.
4. Corrosion-proof and waterproof enclosure suitable for outdoor mounting, for controls and temperature sensors.
5. Minimum 30 A contactor to energize cable or close other contactors.
6. Ground-fault protection.
7. Single-point control of heat tracing for freeze protection[and domestic hot-water-temperature maintenance].
8. Provide communication ports with contacts, RS485, or Ethernet interface for remote monitoring and alarm by central HVAC-control system. Coordinate type of connection ports with Section 230923 "Direct Digital Control (DDC) System for HVAC."

C. Programmable Timer for Domestic Hot-Water-Temperature Maintenance:

1. Microprocessor based.
2. Minimum of four separate schedules.

3. Minimum 24-hour battery carryover.
4. On-off-auto switch.
5. 365-day calendar with 20 programmable holidays.
6. Relays with contacts to indicate operational status, on or off, and for interface with central HVAC-control system.

2.3 ACCESSORIES

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.
- B. Warning Labels: See Section 220553 "Identification for Plumbing Piping and Equipment."
- C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least **3 mils (0.08 mm)** thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 1. Width for Markers on Pipes with OD, Including Insulation, Less Than **6 Inches (150 mm)**: **3/4 inch (19 mm)** minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, **6 Inches (150 mm)** or Larger: **1-1/2 inches (38 mm)** minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install electric heating cable at locations indicated and in accordance with NFPA 70.
- B. Install electric heating cable across expansion, construction, and control joints in accordance with manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- C. Install electric heating cables after piping has been tested and before insulation is installed.
- D. Install electric heating cables in accordance with IEEE 515.1.
- E. Install insulation over piping with electric cables in accordance with Section 220719 "Plumbing Piping Insulation."
- F. Install warning tape on piping insulation where piping is equipped with electric heating cables.

- G. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Install temperature-control units in an accessible location and in accordance with manufacturer's written instructions. Locate sensing bulbs to sense outside air temperature in a location where it will not be affected by direct sunlight or other heat sources.
- I. Install control panels and distribution panels where indicated and in accordance with manufacturer's written instructions.
- J. Install and connect outside air and pipe temperature sensors.

3.3 ELECTRICAL CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Connect temperature-control unit for freeze protection to interrupt power supply to electric heating cable when outside air is above set point.
- D. Connect temperature-control unit for domestic hot-water-temperature maintenance to interrupt power supply to electric heating cable when hot water is above set point.
- E. Connect remote electronic temperature sensors.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
 - 1. Perform tests after cable installation but before application of coverings, such as insulation, wall or ceiling construction, or concrete.
 - 2. Test cables for electrical continuity and insulation integrity before energizing.
 - 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- E. Cables will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.



3.5 PROTECTION

- A. Protect installed heating cables, including nonheating leads, from damage.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION 22 05 33 00



Task	Specification	Specification Description
22 05 33 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 48 00 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient support.
9. Resilient pipe guides.
10. Air-spring isolators.
11. Restrained-air-spring isolators.
12. Elastomeric hangers.
13. Spring hangers.
14. Snubbers.
15. Restraints - rigid type.
16. Restraints - cable type.
17. Restraint accessories.
18. Post-installed concrete anchors.
19. Concrete inserts.
20. Vibration isolation equipment bases.

B. Related Requirements:

1. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for non-structural components.
2. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" specifies devices for fire-suppression equipment and systems.
3. Section 230548 "Vibration and Seismic Controls for HVAC" specifies devices for HVAC equipment and systems.

1.2 DEFINITIONS

- A.** Designated Seismic System: An architectural, mechanical, electrical, plumbing, or fire-protection system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
- B.** IBC: International Building Code.
- C.** OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.3 DELEGATED DESIGN SERVICES

- A. Delegated Design Professional: Engage qualified professional structural engineer to design, sign/seal, seismic and wind restraints.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - b. Include load rating for each seismic-[**and wind**]-restraint device.
 - c. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-[**and wind**]-restraint component.
 - d. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by **[ICC-ES product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]**.
 - e. Annotate to indicate application of each product submitted and compliance with requirements.
 - f. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
3. Show coordination of seismic [**and wind**] restraints for components with other systems and equipment in the vicinity, including other supports and other seismic restraints.

C. Delegated Design Submittal:

1. All delegated design and submittals for **[seismic][and][wind]** restraints must be signed and sealed by a qualified professional structural engineer responsible for their preparation. Structural engineer is to possess qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including design of seismic and wind restraints, equipment hangers and supports, and concrete attachments.
2. For each seismic-restraint device, including **[seismic-restrained mounting,][pipe-riser resilient support,][snubber,][seismic restraint,][seismic-restraint accessory,][and][concrete anchor and insert,]** that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic Restraint, Vibration Isolator, and Vibration Isolation Base Selection: Select and submit seismic restraints **[and]** vibration isolators **[, and vibration isolation bases]** complying with performance requirements, design criteria, and analysis data.
 - b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
 - c. Post-Installed Concrete Anchors and Concrete Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for

- reinforcement use.
 - d. Seismic Design Calculations: Submit all input data and loading calculations.
 - 3. For each wind-restraint device, including **[restraint - rigid,][restraint - cable,][restraint accessory,][concrete anchor,][and][concrete insert]** that is required by this Section or is indicated on Drawings, submit the following:
 - a. Wind Restraints: Select and submit wind restraints complying with performance requirements, design criteria, and analysis data.
 - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing wind-restraint criteria. Include certification that device is approved by qualified testing laboratory for reinforcement use.
 - c. Wind-Restraint Design Calculations: Submit all input data and loading calculations.
 - 4. Seismic- and Wind-Restraint Detail Drawing:
 - a. Design Analysis: To support selection and arrangement of seismic **[and wind]** restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.
 - 5. Product Listing, Preapproval, and Evaluation Documentation: By **[an evaluation service member of ICC-ES][UL][FM Approvals][OSHDP][an agency acceptable to authorities having jurisdiction]**, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
 - 6. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
 - 7. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation **[and wind-]** and seismic-restraint devices for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For **[professional engineer][and][testing agency]**.
- C. Welding certificates.
- D. Air-Spring Isolator Performance Certification: Include natural frequency, load, and damping test data **[performed by an independent agency]**.
- E. Field quality-control reports:

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For **[air-spring isolators][and][restrained-air-spring isolators]** to include in operation and maintenance manuals.

1.7 REGULATORY AGENCY APPROVALS

- A. Delegated design submittals and Shop Drawings requiring approval by authorities having jurisdiction must be signed by qualified structural professional engineer responsible for their preparation. **[Obtain approval by authorities having jurisdiction prior to submitting for action by Architect.][Submit for action by Architect prior to submitting for approval by authorities having jurisdiction.]**

1.8 QUALIFICATIONS

- A. Professional Structural Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including design of seismic and wind restraints, equipment hangers and supports, and concrete foundations.

1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage qualified professional structural engineer to prepare seismic- and wind-restraint calculations in accordance with criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
- B. Seismic- and Wind-Restraint-Device Load Ratings: Devices must be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices are must be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: **[ICC-ES product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][an agency acceptable to authorities having jurisdiction]**.
- C. Consequential Damage: Provide additional seismic **and wind** restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a nonessential or essential component will not cause failure of any other essential building component.
- D. Fire/Smoke Resistance: Seismic- and wind-restraint devices that are not constructed of ferrous metals are to have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when

tested by qualified testing laboratory in accordance with ASTM E84 or UL 723 and be labeled as such.

E. Component Supports:

1. Load ratings, features, and applications of reinforcement components are to be based on testing standards of qualified testing laboratory.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain elastomeric isolation pads from single manufacturer.
4. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
5. Size: Factory or field cut to match requirements of supported equipment.
6. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.

7. Surface Pattern: Smooth, ribbed, or waffle pattern.
8. Infused nonwoven cotton or synthetic fibers.
9. Load-bearing metal plates adhered to pads.
10. Sandwich-Core Material: **[Resilient][and][elastomeric]<Insert compound>**.
 - a. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain double-deflection, elastomeric isolation mounts from single manufacturer.
4. Mounting Plates:

- a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded[**with threaded studs or bolts**].
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
5. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain restrained elastomeric isolation mounts from single manufacturer.
4. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

- a. Housing: Cast-ductile iron or welded steel.
- b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain freestanding, laterally stable, open-spring isolators from single manufacturer.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad

- attached to the underside. Baseplates shall limit floor load to **500 psig (3447 kPa)**.
9. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[Vibration Eliminator Co., Inc]**
 - i. **[Vibration Isolation]**
 - j. **[Vibration Management Corp.]**
 - k. **[VMC GROUP]**
 - l. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[Vibration Eliminator Co., Inc]**
 - i. **[Vibration Isolation]**
 - j. **[Vibration Management Corp.]**
 - k. **[VMC GROUP]**
 - l. **<Insert manufacturer's name>**
3. Source Limitations: Obtain freestanding, laterally stable, housed, open-spring isolators from single manufacturer.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

- a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psig (3447 kPa)**.
- b. Top housing with **[attachment and leveling bolt][threaded mounting holes and internal leveling device][elastomeric pad]**.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain restrained-spring isolators from single manufacturer.
4. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psig (3447 kPa)**.
 - b. Top plate with **[threaded mounting holes][elastomeric pad]**.

- c. Internal leveling bolt that acts as blocking during installation.
- 5. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
- 6. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
- 7. Minimum Additional Travel: 50 percent of the required deflection at rated load.
- 8. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
- 9. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[Vibration Eliminator Co., Inc]**
 - i. **[Vibration Isolation]**
 - j. **[Vibration Management Corp.]**
 - k. **[VMC GROUP]**
 - l. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[Vibration Eliminator Co., Inc]**
 - i. **[Vibration Isolation]**
 - j. **[Vibration Management Corp.]**
 - k. **[VMC GROUP]**
 - l. **<Insert manufacturer's name>**
- 3. Source Limitations: Obtain freestanding, open-spring isolators with vertical-limit stop restraints from single manufacturer.
- 4. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with

[adjustable][nonadjustable] snubbers to limit vertical movement.

- a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psig (3447 kPa)**.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

- A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum 1/2-Inch- (13-mm-) Thick Neoprene :
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain resilient pipe-riser supports from single manufacturer.
 4. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum **1/2-inch- (13-mm-)** thick neoprene.
 5. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
 6. Maximum Load Per Support: **500 psig (3447 KPa)** on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

- A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum 1/2-Inch- (13-mm-) Thick Neoprene :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **[VMC GROUP]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **[VMC GROUP]**
 - g. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain resilient pipe guides from single manufacturer.
 4. Description: resilient pipe guide with telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum **1/2-inch- (13-mm-)** thick neoprene.
 5. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 AIR-SPRING ISOLATORS

- A. Freestanding, Single or Multiple, Compressed-Air Bellows :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtain air-spring isolators from single manufacturer.
 4. Arrangement: **[Single][or][multiple]**.
 5. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
 6. Maximum Natural Frequency: 3 Hz.
 7. Operating Pressure Range: **25 to 100 psig (172 to 690 kPa)**.
 8. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
 9. Automatic leveling valve.

2.12 RESTRAINED-AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows with Vertical-Limit Stop Restraint :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtain restrained-air-spring isolators from single manufacturer.
4. Arrangement: **[Single][or][multiple]**.
5. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psig (3447 kPa)**.
 - b. Top plate with **[threaded mounting holes][elastomeric pad]**.
 - c. Internal leveling bolt that acts as blocking during installation.
6. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
7. Minimum Additional Travel: 50 percent of the required deflection at rated load.
8. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

9. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
10. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
11. Maximum Natural Frequency: **[3 Hz]<Insert frequency>**.
12. Operating Pressure Range: **25 to 100 psig (172 to 690 kPa)**.
13. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
14. Automatic leveling valve.

2.13 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
3. Source Limitations: Obtain elastomeric hangers from a single manufacturer.
4. Description: Elastomeric hanger mounted in a steel frame with upper and lower steel hanger rods.
5. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
6. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.14 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain spring hangers from single manufacturer.
 4. Description: Combination coil-spring and elastomeric-insert hanger.
 5. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 6. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 7. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 8. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 9. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 10. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 11. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 12. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.15 SNUBBERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Kinetics Noise Control, Inc]**
 3. **[Mason Industries, Inc.]**
 4. **[Vibration Management Corp.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[Kinetics Noise Control, Inc]**
 3. **[Mason Industries, Inc.]**
 4. **[Vibration Management Corp.]**
 5. **[VMC GROUP]**
 6. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain snubbers from single manufacturer.
- D. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with **[ACI 318-08 Appendix D for 2009 IBC][ACI 318-11 Appendix D for 2012 IBC][ACI 318-14, Ch. 17 for 2015 or 2018 IBC]**. Preset concrete inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
 2. Anchors in Masonry: Design in accordance with TMS 402.
 3. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 4. Resilient Cushion: Maximum **1/4-inch (6-mm)** air gap, and minimum **1/4 inch (6 mm)** thick.

2.16 RESTRAINTS - RIGID TYPE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[California Dynamics Corporation]**
 4. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 5. **[Hilti, Inc.]**
 6. **[Isolation Technology, Inc]**
 7. **[TOLCO Incorporated]**
 8. **[VMC GROUP]**
 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's**

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name; product name or designation> or comparable product by one of the following:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [California Dynamics Corporation]
4. [Cooper B-line; brand of Eaton, Electrical Sector]
5. [Hilti, Inc.]
6. [Isolation Technology, Inc]
7. [TOLCO Incorporated]
8. [VMC GROUP]
9. <Insert manufacturer's name>

C. Source Limitations: Obtain rigid-type restraints from single manufacturer.

D. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.17 RESTRAINTS - CABLE TYPE

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

C. Source Limitations: Obtain cable-type restraints from single manufacturer.

D. Seismic- and Wind-Restraint Cables: **[ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel][ASTM A492 stainless steel]** cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

E. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge type end fittings do not comply and are unacceptable.

2.18 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 4. **[Hilti, Inc.]**
 5. **[Loos & Co. Inc.]**
 6. **[Mason Industries, Inc.]**
 7. **[TOLCO Incorporated]**
 8. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Atkore Unistrut]**
 2. **[CADDY; brand of nVent Electrical plc]**
 3. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 4. **[Hilti, Inc.]**
 5. **[Loos & Co. Inc.]**
 6. **[Mason Industries, Inc.]**
 7. **[TOLCO Incorporated]**
 8. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain restraint accessories from single manufacturer.
- D. Hanger-Rod Stiffener: **[Steel tube or steel slotted-support-system sleeve with internally bolted connections][Reinforcing steel angle clamped]** to hanger rod. Non-metallic stiffeners are unacceptable.
- E. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to **[rigid channel bracings][and][restraint cables]**.
- F. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.19 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain mechanical anchor bolts from single manufacturer.
4. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain adhesive anchor bolts from single manufacturer.
4. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select

anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

- C. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of **[ASCE/SEI 7-05, Ch. 13][ASCE/SEI 7-10, Ch. 13][ASCE/SEI 7-16, Ch. 13]**.
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of **10 hp (7.46 kW)**, which is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.20 CONCRETE INSERTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Atkore Unistrut]**
 - 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - 3. **[Hilti, Inc.]**
 - 4. **[Mason Industries, Inc.]**
 - 5. **[Powers Fasteners]**
 - 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Atkore Unistrut]**
 - 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - 3. **[Hilti, Inc.]**
 - 4. **[Mason Industries, Inc.]**
 - 5. **[Powers Fasteners]**
 - 6. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain concrete inserts from single manufacturer.
- D. Provide preset concrete inserts, which are seismically prequalified in accordance with ICC-ES AC466 testing.
- E. Comply with ANSI/MSS 58.

2.21 VIBRATION ISOLATION EQUIPMENT BASES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. [CADDY; brand of nVent Electrical plc]
2. [California Dynamics Corporation]
3. [Kinetics Noise Control, Inc]
4. [Mason Industries, Inc.]
5. [NOVIA; a division of Carpenter & Paterson]
6. [Vibration Eliminator Co., Inc]
7. [Vibration Isolation]
8. [Vibration Management Corp.]
9. [VMC GROUP]
10. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [California Dynamics Corporation]
3. [Kinetics Noise Control, Inc]
4. [Mason Industries, Inc.]
5. [NOVIA; a division of Carpenter & Paterson]
6. [Vibration Eliminator Co., Inc]
7. [Vibration Isolation]
8. [Vibration Management Corp.]
9. [VMC GROUP]
10. <Insert manufacturer's name>

C. Source Limitations: Obtain vibration isolation equipment bases from single manufacturer.

D. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

E. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

F. Concrete Inertia Base: [Factory-fabricated][or][field-fabricated], welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic- **[and wind-]**restraint devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]**.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support Assemblies: Where not specifically indicated otherwise, select sizes of components so strength is adequate to carry static[, **wind load,**] and seismic load within specified loading limits.

3.3 INSTALLATION OF VIBRATION CONTROLS AND SEISMIC RESTRAINTS FOR PLUMBING PIPING AND EQUIPMENT

- A. Provide seismic-**[and wind-]**restraint devices and vibration-control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.
- B. Provide seismic-restraint **[and wind-restraint]**devices for systems and equipment where indicated in Equipment Schedules or Seismic-Restraint Devices Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where

required by applicable codes.

- C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- D. Installation of vibration isolators[, **wind-restraints**,] and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.
- E. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- F. Equipment Restraints:
 - 1. Install snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds **0.125 inch (3.2 mm)**.
 - 3. Install seismic-restraint[**and wind-restraint**] devices using methods approved by [an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction] that provides required submittals for component.
- G. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of [40 feet (12 m)]<Insert dimension> o.c., and longitudinal supports a maximum of [80 feet (24 m)]<Insert dimension> o.c.
 - 3. Brace a change of direction longer than **12 feet (3.7 m)**.
- H. Install seismic-[**and wind**]-restraint cables so they do not bend across edges of adjacent equipment or building structure.
- I. Install seismic-[**and wind**]-restraint devices using methods approved by [an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction] that provides required submittals for component.
- J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- M. Post-Installed Concrete Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify Project structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Mechanical Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 INSTALLATION OF AIR-SPRING ISOLATORS

A. Independent Isolator Installation:

1. Install automatic leveling valve into each air isolator.
2. Inflate each isolator to **[height][and][pressure]** specified on Drawings.

B. Pressure-Regulated Isolator Installation:

1. Coordinate the constant pressure-regulated air supply to air springs with the requirements for piping and connections specified in Section 221513 "General-Service Compressed-Air Piping."
2. Connect all pressure regulators to a single dry, filtered **[facility][constant]** air supply.
3. Inflate isolators to **[height][and][or][pressure]** specified on Drawings.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- #### A.
- Provide flexible connections in piping systems where they cross structural seismic joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as determined in accordance with ASCE/SEI 7. Comply with requirements in Section 221116 "Domestic Water Piping" and Section 221119 "Domestic Water Piping Specialties" for piping flexible connections.

3.6 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT BASES

- #### A.
- Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- #### B.
- Coordinate dimensions of steel equipment rails, bases, and concrete inertia bases, with requirements of isolated equipment specified in this and other Sections. Where dimensions of bases are indicated on Drawings, they may require adjustment to accommodate actual isolated equipment.

3.7 ADJUSTING

- #### A.
- Adjust isolators after system is at operating weight.
- #### B.
- Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 - 1. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].
 - 2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 5. Test at least **[four]<Insert number>** of each type and size of installed anchors and fasteners selected by Architect.
 - 6. Test to 90 percent of rated proof load of device.
 - 7. Measure isolator restraint clearance.
 - 8. Measure isolator deflection.
 - 9. Verify snubber minimum clearances.
 - 10. Test and adjust restrained-air-spring isolator controls and safeties.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Units will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 22 05 48 00



Task	Specification	Specification Description
22 05 48 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 48 13 - VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient support.
9. Resilient pipe guides.
10. Air-spring isolators.
11. Restrained-air-spring isolators.
12. Elastomeric hangers.
13. Spring hangers.
14. Snubbers.
15. Restraints - rigid type.
16. Restraints - cable type.
17. Restraint accessories.
18. Post-installed concrete anchors.
19. Concrete inserts.
20. Vibration isolation equipment bases.

B. Related Requirements:

1. Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment" for devices for fire-suppression equipment and systems.
2. Section 230548.13 "Vibration Controls for HVAC" for devices for HVAC equipment and systems.

1.2 DEFINITIONS

- ##### A. IBC: International Building Code.
- ##### B. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Include load rating for each wind-load-restraint fitting and assembly.
3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device **[and wind-load-restraint]** component.

4. Annotate to indicate application of each product submitted and compliance with requirements.
5. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal:

1. For each wind-load protection device that is required by this Section or is indicated on Drawings, submit the following:
 - a. Vibration Isolator and Wind-Load-Restraint Selection: Select vibration isolators and wind-load restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.
 - b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
 - c. Concrete Anchors and Inserts: Include calculations showing anticipated wind loads.
 - d. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" Paragraph in "Performance Requirements" Article.
 - 1) Qualified Professional Engineer: All designated-design submittals for wind-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.
 - e. Wind-Restraint Detail Drawings:
 - 1) Design Analysis: To support selection and arrangement of wind restraints. Include calculations of combined tensile and shear loads.
 - 2) Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during wind events. Indicate association with vibration isolation devices.
 - 3) Coordinate vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.
 - f. All delegated-design submittals for wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
 - g. Product Listing, Preapproval, and Evaluation Documentation: By **[an evaluation service member of ICC-ES][UL][FM Approvals][OSHPD][an agency acceptable to authorities having jurisdiction]**, showing maximum ratings of restraint items and basis for approval (tests or calculations).
2. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design

vibration isolation bases.

3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation **[and wind-load reinforcement]** device installation for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For **[professional engineer]****[and]****[testing agency]**.
- C. Welding certificates.
- D. Air-Spring Mounting System Performance Certification: Include natural frequency, load, and damping test data **[performed by an independent agency]**.
- E. Field quality-control reports.
- F. Wind-Load Performance Certification: Provide special certification for plumbing components subject to high wind exposure and impact damage and designated on Drawings or in the Specifications to require wind-load performance certification.
 1. Provide equipment manufacturer's written certification for each designated plumbing device, stating that it will remain in place and operable following the design wind event and comply with all requirements of authorities having jurisdiction.
 2. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.
 3. The following plumbing systems and components require special certification for high wind performance. Written special certification of resistance to the effects of high wind load and impact damage must be provided by manufacturer.
 - a. **<Insert list>**.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For **[air-spring mounts]****[and]****[restrained-air-spring mounts]** to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be an NRTL as defined by OSHA in 29 CFR 1910.7 and be acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally



recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: **[ICC-ES product listing][UL product listing][FM Approvals][an evaluation service member of ICC-ES][an agency acceptable to authorities having jurisdiction]**.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design system.
 - 1. Wind-Load Performance: Equipment and systems shall withstand the effects of high wind events determined in accordance with **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]<Insert requirement>**.
- B. Wind-Load Design Calculations:
 - 1. Perform calculations to obtain force information necessary to properly select wind-load-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]<Insert ASCE/SEI 7 edition or other wind-load calculation method required by authorities having jurisdiction>**. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise noted.
 - a. Factors indicated below that are specific to individual pieces of equipment must be obtained by Contractor and must be included in individual component submittal packages.
 - b. Coordinate design wind-load calculations with vibration isolator calculations for equipment requiring both vibration isolation and wind-load reinforcement. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.
 - 2. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:
 - a. PART 1: Low-Rise Buildings.
 - b. PART 2: Low-Rise Buildings (Simplified).
 - c. PART 3: Buildings with "h" less than **60 feet (18.3 m)**.
 - d. PART 4: Buildings with "h" greater than **60 feet (18.3 m)** and less than **160 feet (48.8 m)**.
 - e. PART 5: Open Buildings.
 - 3. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - a. Risk Category: **[I][II][III][IV][V]**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. Kd = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. Kzt = Topographic Factor: **<Insert factor>**.
 - g. Ke = Ground Elevation Factor: **<Insert factor>**.

- h. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.
 - i. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - j. q_z = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - k. q_h = Velocity Pressure: Value calculated by delegated wind-load design contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - l. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - m. Enclosure Classification: **<Insert classification>**.
 - n. G_{Cpi} = Internal Pressure Coefficient: **<Insert coefficient>**.
4. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:
 - a. PART 1: Low-Rise Buildings.
 - b. PART 2: Low-Rise Buildings (Simplified).
 - c. PART 3: Buildings with "h" greater than **60 feet (18.3 m)**.
 - d. PART 4: Buildings with "h" less than **160 feet (48.8 m)**.
 - e. PART 5: Open Buildings.
 5. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - a. Risk Category: **[I][II][III][IV][V]**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. K_d = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. K_{zt} = Topographic Factor: **<Insert factor>**.
 - g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.
 - h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - i. q_z = Velocity Pressure at Height z : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - j. q_h = Velocity Pressure at Height h : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - k. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - l. Enclosure Classification: **<Insert classification>**.
 - m. G_{Cpi} = Internal Pressure Coefficient: **<Insert coefficient>**.
 6. Design wind load "F" for rooftop equipment and external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-05, Ch. 6.
 - a. I = Importance Factor: **<Insert factor>**.
 - b. h = Mean Roof Height: **<Insert value>**.
 - c. V = Basic Wind Speed: **<Insert value>**.
 - d. K_d = Wind Directionality Factor: **<Insert factor>**.
 - e. Exposure Category: **[B][C][D]**.
 - f. K_{zt} = Topographic Factor: **<Insert factor>**.
 - g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): **<Insert coefficient>**.
 - h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): **<Insert coefficient>**.
 - i. q_z = Velocity Pressure at Height z : Value calculated by delegated wind-load design

- Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
- j. q_h = Velocity Pressure at Roof Height h : Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
 - k. G = Gust-Effect Factor: **[0.85]<Insert factor>**.
 - l. GC_{pi} = Internal Pressure Coefficient: **<Insert coefficient>**.
 - m. GC_{pe} = External Pressure Coefficient: **<Insert coefficient>**.
 - n. C_f = Force Coefficient: Value determined by delegated wind-load design Contractor from ASCE/SEI 7-05, Figures 6-21 through 6-23 or other source approved by authorities having jurisdiction.
 - o. A_f = Projected Area Normal to the Wind: Except where C_f is specified for the actual surface area. Value determined by delegated wind-load design Contractor from equipment submittal or manufacturer.

- C. Consequential Damage: Provide additional restraints for suspended fire-suppression system components or anchorage of floor-, roof-, or wall-mounted fire-suppression system components as indicated in **[ASCE/SEI 7-05][ASCE/SEI 7-10][ASCE/SEI 7-16]** so that failure of a non-essential or essential fire-suppression system component will not cause failure of any other essential architectural, mechanical, or electrical building component.
- D. Fire/Smoke Resistance: All components that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- E. Component Supports:
 - 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
 - 2. All component support attachments must comply with force and displacement resistance requirements of **[ASCE/SEI 7-05 Section 13.6][ASCE/SEI 7-10 Section 13.6][ASCE/SEI 7-16 Section 13.6]**.

2.2 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads: .
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**

- m. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
- 3. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
- 4. Size: Factory or field cut to match requirements of supported equipment.
- 5. Minimum deflection as indicated on Drawings.
- 6. Pad Material: Oil- and water-resistant rubber.
- 7. Infused nonwoven cotton or synthetic fibers.
- 8. Load-bearing metal plates adhered to pads.
- 9. Sandwich-Core Material: [Resilient][and][elastomeric]<Insert compound>.
 - a. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Elastomeric Isolation Mounts: .

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Ace Mountings Co., Inc.]**
- b. **[CADDY; brand of nVent Electrical plc]**
- c. **[California Dynamics Corporation]**
- d. **[Isolation Technology, Inc]**
- e. **[Kinetics Noise Control, Inc]**
- f. **[Korfund]**
- g. **[Mason Industries, Inc.]**
- h. **[NOVIA; a division of Carpenter & Paterson]**
- i. **[Vibration Eliminator Co., Inc]**
- j. **[Vibration Isolation]**
- k. **[Vibration Management Corp.]**
- l. **[VMC GROUP]**
- m. **<Insert manufacturer's name>**

3. Mounting Plates:

- a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded[**with threaded studs or bolts**].
- b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

- 4. Minimum deflection as indicated on Drawings.
- 5. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts: .

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
3. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.
 4. Minimum deflection as indicated on Drawings.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]

- f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 7. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to **500 psi (3447 kPa)**.
 8. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
 9. Minimum deflection as indicated on Drawings.

2.6 HOUSED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing: .
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [Vibration Eliminator Co., Inc]
 - i. [Vibration Isolation]
 - j. [Vibration Management Corp.]
 - k. [VMC GROUP]
 - l. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]

- h. [Vibration Eliminator Co., Inc]
 - i. [Vibration Isolation]
 - j. [Vibration Management Corp.]
 - k. [VMC GROUP]
 - l. <Insert manufacturer's name>
- 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 7. Minimum deflection as indicated on Drawings.
 - 8. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psi (3447 kPa)**.
 - b. Top housing with **[attachment and leveling bolt][threaded mounting holes and internal leveling device][elastomeric pad]**.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint: .

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [NOVIA; a division of Carpenter & Paterson]
 - i. [Vibration Eliminator Co., Inc]
 - j. [Vibration Isolation]
 - k. [Vibration Management Corp.]
 - l. [VMC GROUP]
 - m. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Ace Mountings Co., Inc.]
 - b. [CADDY; brand of nVent Electrical plc]
 - c. [California Dynamics Corporation]
 - d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]

- h. **[NOVIA; a division of Carpenter & Paterson]**
 - i. **[Vibration Eliminator Co., Inc]**
 - j. **[Vibration Isolation]**
 - k. **[Vibration Management Corp.]**
 - l. **[VMC GROUP]**
 - m. **<Insert manufacturer's name>**
3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
- a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psi (3447 kPa)**.
 - b. Top plate with **[threaded mounting holes][elastomeric pad]**.
 - c. Internal leveling bolt that acts as blocking during installation.
4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
9. Minimum deflection as indicated on Drawings.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing: .
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Isolation Technology, Inc]**
 - e. **[Kinetics Noise Control, Inc]**
 - f. **[Korfund]**
 - g. **[Mason Industries, Inc.]**
 - h. **[Vibration Eliminator Co., Inc]**
 - i. **[Vibration Isolation]**
 - j. **[Vibration Management Corp.]**
 - k. **[VMC GROUP]**
 - l. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**

- d. [Isolation Technology, Inc]
 - e. [Kinetics Noise Control, Inc]
 - f. [Korfund]
 - g. [Mason Industries, Inc.]
 - h. [Vibration Eliminator Co., Inc]
 - i. [Vibration Isolation]
 - j. [Vibration Management Corp.]
 - k. [VMC GROUP]
 - l. <Insert manufacturer's name>
3. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with **[adjustable][non-adjustable]** snubbers to limit vertical movement.
- a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psi (3447 kPa)**.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Minimum deflection as indicated on Drawings.

2.9 PIPE-RISER RESILIENT SUPPORT

- A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum **1/2-inch- (13-mm-)** Thick Neoprene: .
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [California Dynamics Corporation]
 - b. [Kinetics Noise Control, Inc]
 - c. [Mason Industries, Inc.]
 - d. [Vibration Eliminator Co., Inc]
 - e. [Vibration Management Corp.]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [California Dynamics Corporation]
 - b. [Kinetics Noise Control, Inc]
 - c. [Mason Industries, Inc.]
 - d. [Vibration Eliminator Co., Inc]
 - e. [Vibration Management Corp.]
 - f. <Insert manufacturer's name>
 - 3. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in

- both directions.
- 4. Maximum Load Per Support: **500 psi (3447 kPa)** on isolation material providing equal isolation in all directions.
- 5. Minimum deflection as indicated on Drawings.

2.10 RESILIENT PIPE GUIDES

- A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum **1/2-inch- (13-mm-)** Thick Neoprene: .
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **[VMC GROUP]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[California Dynamics Corporation]**
 - b. **[Kinetics Noise Control, Inc]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Eliminator Co., Inc]**
 - e. **[Vibration Management Corp.]**
 - f. **[VMC GROUP]**
 - g. **<Insert manufacturer's name>**
 - 3. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 AIR-SPRING ISOLATORS

- A. Freestanding, Single or Multiple, Compressed-Air Bellows: .
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
3. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
4. Maximum Natural Frequency: 3 Hz.
5. Operating Pressure Range: **25 to 100 psi (172 to 690 kPa)**.
6. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
7. Minimum deflection as indicated on Drawings.
8. Automatic leveling valve.

2.12 RESTRAINED-AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows with Vertical-Limit Stop Restraint: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CADDY; brand of nVent Electrical plc]**
 - b. **[Firestone Industrial Products Company]**
 - c. **[Mason Industries, Inc.]**
 - d. **[Vibration Management Corp.]**
 - e. **<Insert manufacturer's name>**
3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to **500 psi (3447 kPa)**.
 - b. Top plate with **[threaded mounting holes][elastomeric pad]**.
 - c. Internal leveling bolt that acts as blocking during installation.
4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Minimum deflection as indicated on Drawings.
6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
9. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
10. Maximum Natural Frequency: 3 Hz.
11. Operating Pressure Range: **25 to 100 psi (172 to 690 kPa).**
12. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
13. Automatic leveling valve.

2.13 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
3. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
4. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.
5. Minimum deflection as indicated on Drawings.

2.14 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ace Mountings Co., Inc.]**
 - b. **[CADDY; brand of nVent Electrical plc]**
 - c. **[California Dynamics Corporation]**
 - d. **[Kinetics Noise Control, Inc]**
 - e. **[Mason Industries, Inc.]**
 - f. **[NOVIA; a division of Carpenter & Paterson]**
 - g. **[Vibration Eliminator Co., Inc]**
 - h. **[Vibration Isolation]**
 - i. **[Vibration Management Corp.]**
 - j. **[VMC GROUP]**
 - k. **<Insert manufacturer's name>**
 3. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 7. Minimum deflection as indicated on Drawings.
 8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 9. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 10. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 11. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.15 SNUBBERS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [CADDY; brand of nVent Electrical plc]
2. [Kinetics Noise Control, Inc]
3. [Mason Industries, Inc.]
4. [Vibration Management Corp.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [Kinetics Noise Control, Inc]
3. [Mason Industries, Inc.]
4. [Vibration Management Corp.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

C. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be prequalified in accordance with ACI 355.2 testing and designated in accordance with [ACI 318-08 Appendix D for 2009 IBC][ACI 318-11 Appendix D for 2012 IBC][ACI 318-14 Ch. 17 for 2015 or 2018 IBC]
2. Preset Concrete Inserts: Prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch (6-mm) air gap, and minimum 1/4 inch (6 mm) thick.

2.16 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [California Dynamics Corporation]
4. [Cooper B-line; brand of Eaton, Electrical Sector]
5. [Hilti, Inc.]
6. [Isolation Technology, Inc]
7. [TOLCO Incorporated]
8. [VMC GROUP]
9. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [California Dynamics Corporation]

4. [Cooper B-line; brand of Eaton, Electrical Sector]
5. [Hilti, Inc.]
6. [Isolation Technology, Inc]
7. [TOLCO Incorporated]
8. [VMC GROUP]
9. <Insert manufacturer's name>

- C. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.17 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [CADDY; brand of nVent Electrical plc]
2. [Cooper B-line; brand of Eaton, Electrical Sector]
3. [Gripple Inc.]
4. [Loos & Co. Inc.]
5. [VMC GROUP]
6. <Insert manufacturer's name>

- C. Restraint Cables: **[ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel][ASTM A492 stainless steel]** cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.

- D. Restraint cable assembly and cable fittings must comply with **[ASCE/SEI 19-10][ASCE/SEI 19-16]**. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.18 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [Cooper B-line; brand of Eaton, Electrical Sector]

4. [Hilti, Inc.]
5. [Loos & Co. Inc.]
6. [Mason Industries, Inc.]
7. [TOLCO Incorporated]
8. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. [Atkore Unistrut]
2. [CADDY; brand of nVent Electrical plc]
3. [Cooper B-line; brand of Eaton, Electrical Sector]
4. [Hilti, Inc.]
5. [Loos & Co. Inc.]
6. [Mason Industries, Inc.]
7. [TOLCO Incorporated]
8. <Insert manufacturer's name>

C. Hanger-Rod Stiffener: **[Steel tube or steel slotted-support-system sleeve with internally bolted connections][Reinforcing steel angle clamped]** to hanger rod.

D. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to **[rigid channel bracings][and][restraint cables]**.

E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.19 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Atkore Unistrut]
- b. [Cooper B-line; brand of Eaton, Electrical Sector]
- c. [Hilti, Inc.]
- d. [Mason Industries, Inc.]
- e. [Powers Fasteners]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 3. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.
- B. Adhesive Anchor Bolts:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Atkore Unistrut]**
 - b. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 - c. **[Hilti, Inc.]**
 - d. **[Mason Industries, Inc.]**
 - e. **[Powers Fasteners]**
 - f. **<Insert manufacturer's name>**
 3. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.
- C. Provide post-installed concrete anchors that have been prequalified for use in wind-load applications. Post-installed concrete anchors must comply with all requirements of **[ASCE/SEI 7-05, Ch. 13][ASCE/SEI 7-10, Ch. 13][ASCE/SEI 7-16, Ch. 13]**.
1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of **10 hp (7.46 kW)** that is not vibration isolated.
1. Undercut expansion anchors are permitted.

2.20 CONCRETE INSERTS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Atkore Unistrut]**
 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 3. **[Hilti, Inc.]**
 4. **[Mason Industries, Inc.]**
 5. **[Powers Fasteners]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Atkore Unistrut]**
 2. **[Cooper B-line; brand of Eaton, Electrical Sector]**
 3. **[Hilti, Inc.]**
 4. **[Mason Industries, Inc.]**
 5. **[Powers Fasteners]**
 6. **<Insert manufacturer's name>**
- C. Provide preset concrete inserts that are prequalified in accordance with ICC-ES AC466 testing.
- D. Comply with ANSI/MSS SP-58.

2.21 VIBRATION ISOLATION EQUIPMENT BASES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[California Dynamics Corporation]**
 3. **[Kinetics Noise Control, Inc]**
 4. **[Mason Industries, Inc.]**
 5. **[NOVIA; a division of Carpenter & Paterson]**
 6. **[Vibration Eliminator Co., Inc]**
 7. **[Vibration Isolation]**
 8. **[Vibration Management Corp.]**
 9. **[VMC GROUP]**
 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[CADDY; brand of nVent Electrical plc]**
 2. **[California Dynamics Corporation]**
 3. **[Kinetics Noise Control, Inc]**
 4. **[Mason Industries, Inc.]**
 5. **[NOVIA; a division of Carpenter & Paterson]**
 6. **[Vibration Eliminator Co., Inc]**
 7. **[Vibration Isolation]**

8. [Vibration Management Corp.]
9. [VMC GROUP]
10. <Insert manufacturer's name>

C. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

D. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

E. Concrete Inertia Base: [**Factory-fabricated**][or][**field-fabricated**], welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than **1-inch (25-mm)** clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation [**and wind-load control**]devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]**.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to wind load forces.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength is adequate to carry static **[and wind-load]** forces within specified loading limits.

3.3 INSTALLATION OF VIBRATION-CONTROL AND WIND-LOAD CONTROL DEVICES

- A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.
- B. Provide wind-load control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
- C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- D. Installation of vibration isolators **[and wind-load restraints]** must not cause any stresses, misalignment or change of position of equipment or piping.
- E. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- F. Equipment Restraints:
 - 1. Install snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds **0.125 inch (3.2 mm)**.
 - 3. Install wind-load-restraint devices using methods approved by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]** that provides required submittals for component.
- G. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of **[40 feet (12 m)]<Insert dimension>** o.c., and longitudinal supports a maximum of **[80 feet (24 m)]<Insert dimension>** o.c.

3. Brace a change of direction longer than **12 feet (3.7 m)**.
 - H. Install wind-load-restraint cables so they do not bend across edges of adjacent equipment or building structure.
 - I. Install wind-load-restraint devices using methods approved by **[an evaluation service member of ICC-ES][OSHPD][an agency acceptable to authorities having jurisdiction]** that provides required submittals for component.
 - J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
 - K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
 - L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
 - M. Post-Installed Concrete Anchors:
 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify Project structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.
- 3.4 INSTALLATION OF AIR-SPRING ISOLATORS
- A. Independent Isolator Installation:
 1. Install automatic leveling valve into each air isolator.
 2. Inflate each isolator to **[height][and][pressure]** specified on Drawings.
 - B. Pressure-Regulated Isolator Installation:
 1. Coordinate the constant pressure-regulated air supply to air springs with requirements for piping and connections specified in Section 221513 "General-Service Compressed-Air Piping."
 2. Connect all pressure regulators to a single dry, filtered **[facility][constant]** air supply.
 3. Inflate isolators to **[height][and][or][pressure]** specified on Drawings.
- 3.5 ACCOMMODATION OF DIFFERENTIAL MOTION
- A. Provide flexible connections in piping systems where they cross structural joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as

determined in accordance with ASCE/SEI 7. Comply with requirements in Section 221116 "Domestic Water Piping" and Section 221119 "Domestic Water Piping Specialties" for piping flexible connections.

3.6 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT BASES

- A. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate dimensions of steel equipment rails, bases, and concrete inertia bases, with requirements of isolated equipment specified in this and other Sections. Where dimensions of base are indicated on Drawings, they may require adjustment to accommodate actual isolated equipment.

3.7 ADJUSTING

- A. Adjust isolators after system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 - 1. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].
 - 2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 5. Test no fewer than **[four]<Insert number>** of each type and size of installed anchors and fasteners selected by Architect.
 - 6. Test to 90 percent of rated proof load of device.
 - 7. Measure isolator restraint clearance.
 - 8. Measure isolator deflection.
 - 9. Verify snubber minimum clearances.
 - 10. Test and adjust restrained-air-spring isolator controls and safeties.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Units will be considered defective if they do not pass tests and inspections.



- F. Prepare test and inspection reports.

END OF SECTION 22 05 48 13

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Task	Specification	Specification Description
22 05 48 13	22 05 48 00	Vibration And Seismic Controls For Plumbing Piping And Equipment
22 05 48 13	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 53 00 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Warning tape.
4. Pipe labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

B. Related Requirements:

1. Section 226113 "Compressed-Air Piping for Laboratory and Healthcare Facilities" for labeling requirements, complying with NFPA 99, for medical, compressed-air system piping and associated components in healthcare facilities.
2. Section 226213 "Vacuum Piping for Laboratory and Healthcare Facilities" for labeling requirements, complying with NFPA 99, for medical surgical, healthcare laboratory, and dental vacuum system piping, waste anesthetic gas and oral evacuation system piping, and associated components in healthcare facilities.
3. Section 226313 "Gas Piping for Laboratory and Healthcare Facilities" for labeling requirements, complying with NFPA 99, for medical carbon dioxide, laboratory carbon dioxide, medical helium, laboratory helium, medical nitrogen, laboratory nitrogen, medical nitrous oxide, laboratory nitrous oxide, medical oxygen, and laboratory oxygen.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment-Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve-numbering scheme.
- E. Valve Schedules: For each piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarker.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>

3. Material and Thickness: [Brass, 0.032-inch (0.8-mm)][stainless steel, 0.025-inch (0.64-mm)][aluminum, 0.032-inch (0.8-mm)][anodized aluminum, 0.032-inch (0.8-mm)] minimum thickness, with predrilled or stamped holes for attachment hardware.
4. Letter and Background Color: As indicated for specific application under Part 3.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Brady Corporation]
 - b. [Carlton Industries, LP]

- c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarket.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Brady Corporation]
 - b. [Carlton Industries, LP]
 - c. [Champion America]
 - d. [Craftmark Pipe Markers]
 - e. [emedco]
 - f. [Kolbi Pipe Marker Co.]
 - g. [LEM Products Inc.]
 - h. [Marking Services Inc.]
 - i. [Pipemarket.com; Brimar Industries, Inc.]
 - j. [Seton Identification Products; a Brady Corporation company]
 - k. <Insert manufacturer's name>
3. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, [1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension> thick, with predrilled holes for attachment hardware.
4. Letter and Background Color: As indicated for specific application under Part 3.
5. Maximum Temperature: Able to withstand temperatures of up to **160 deg F (71 deg C)**.
6. Minimum Label Size: Length and width vary for required label content, but not less than **2-1/2 by 3/4 inch (64 by 19 mm)**.
7. Minimum Letter Size: **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances of up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
8. Fasteners: Stainless steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Brady Corporation]
 2. [Carlton Industries, LP]
 3. [Champion America]
 4. [Craftmark Pipe Markers]
 5. [emedco]

6. [LEM Products Inc.]
7. [Marking Services Inc.]
8. [National Marker Company]
9. [Pipemarker.com; Brimar Industries, Inc.]
10. [Seton Identification Products; a Brady Corporation company]
11. [Stranco, Inc.]
12. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Brady Corporation]
2. [Carlton Industries, LP]
3. [Champion America]
4. [Craftmark Pipe Markers]
5. [emedco]
6. [LEM Products Inc.]
7. [Marking Services Inc.]
8. [National Marker Company]
9. [Pipemarker.com; Brimar Industries, Inc.]
10. [Seton Identification Products; a Brady Corporation company]
11. [Stranco, Inc.]
12. <Insert manufacturer's name>

C. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, [1/16 inch (1.6 mm)][1/8 inch (3.2 mm)]<Insert dimension> thick, with predrilled holes for attachment hardware.

D. Letter and Background Color: As indicated for specific application under Part 3.

E. Maximum Temperature: Able to withstand temperatures of up to 160 deg F (71 deg C).

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

G. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

H. Fasteners: Stainless steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E[, and other applicable codes and standards].

K. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 WARNING TAPE

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Brady Corporation]
2. [Craftmark Pipe Markers]
3. [National Marker Company]
4. [Pipemarker.com; Brimar Industries, Inc.]
5. [Seton Identification Products; a Brady Corporation company]
6. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Brady Corporation]
2. [Craftmark Pipe Markers]
3. [National Marker Company]
4. [Pipemarker.com; Brimar Industries, Inc.]
5. [Seton Identification Products; a Brady Corporation company]
6. <Insert manufacturer's name>

C. Material: Vinyl.

D. Minimum Thickness: **0.005 inch (0.12 mm)**.

E. Letter, Pattern, and Background Color: As indicated for specific application under Part 3.

F. Waterproof Adhesive Backing: Suitable for indoor or outdoor use.

G. Maximum Temperature: **160 deg F (70 deg C)**.

H. Minimum Width: [**2 inches (50 mm)**][**4 inches (100 mm)**].

2.4 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]
2. [Brady Corporation]
3. [Carlton Industries, LP]
4. [Champion America]
5. [Craftmark Pipe Markers]
6. [emedco]
7. [Kolbi Pipe Marker Co.]
8. [LEM Products Inc.]
9. [Marking Services Inc.]
10. [Pipemarker.com; Brimar Industries, Inc.]
11. [Seton Identification Products; a Brady Corporation company]
12. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]
2. [Brady Corporation]
3. [Carlton Industries, LP]
4. [Champion America]

5. [Craftmark Pipe Markers]
6. [emedco]
7. [Kolbi Pipe Marker Co.]
8. [LEM Products Inc.]
9. [Marking Services Inc.]
10. [Pipemarker.com; Brimar Industries, Inc.]
11. [Seton Identification Products; a Brady Corporation company]
12. <Insert manufacturer's name>

- C. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.
- D. Letter and Background Color: As indicated for specific application under Part 3.
- E. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to **[partially cover][cover full]** circumference of pipe and to attach to pipe without fasteners or adhesive.
- F. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- G. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:
 1. Pipe size.
 2. Flow-Direction Arrows: Include flow-direction arrows on **[main]** distribution piping. Arrows may be either integral with label or applied separately.
 3. Lettering Size: **[Size letters in accordance with ASME A13.1 for piping][At least 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances].**

2.5 STENCILS

- A. Stencils for Piping:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Craftmark Pipe Markers]
 - b. [Kolbi Pipe Marker Co.]
 - c. [Marking Services Inc.]
 - d. [Pipemarker.com; Brimar Industries, Inc.]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Craftmark Pipe Markers]
 - b. [Kolbi Pipe Marker Co.]
 - c. [Marking Services Inc.]
 - d. [Pipemarker.com; Brimar Industries, Inc.]
 - e. <Insert manufacturer's name>

3. Lettering Size: **[Size letters in accordance with ASME A13.1 for piping][At least 1/2 inch (13 mm) for viewing distances of up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances].**
4. Stencil Material: Aluminum, brass, or fiberboard.
5. Stencil Paint: Exterior, gloss, **[alkyd enamel][acrylic enamel]<Insert paint type>** in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
6. Identification Paint: Exterior, **[alkyd enamel][acrylic enamel]<Insert paint type>** in colors in accordance with ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
7. Letter and Background Color: As indicated for specific application under Part 3.

2.6 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]**
 2. **[Brady Corporation]**
 3. **[Carlton Industries, LP]**
 4. **[Champion America]**
 5. **[Craftmark Pipe Markers]**
 6. **[emedco]**
 7. **[Kolbi Pipe Marker Co.]**
 8. **[LEM Products Inc.]**
 9. **[Marking Services Inc.]**
 10. **[Pipemarker.com; Brimar Industries, Inc.]**
 11. **[Seton Identification Products; a Brady Corporation company]**
 12. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.]**
 2. **[Brady Corporation]**
 3. **[Carlton Industries, LP]**
 4. **[Champion America]**
 5. **[Craftmark Pipe Markers]**
 6. **[emedco]**
 7. **[Kolbi Pipe Marker Co.]**
 8. **[LEM Products Inc.]**
 9. **[Marking Services Inc.]**
 10. **[Pipemarker.com; Brimar Industries, Inc.]**
 11. **[Seton Identification Products; a Brady Corporation company]**
 12. **<Insert manufacturer's name>**
- C. Description: Stamped or engraved with **1/4-inch (6.4-mm)** letters for piping system abbreviation and **1/2-inch (13-mm)** numbers.
1. Tag Material: **[Brass, 0.04-inch (1.0-mm)][stainless steel, 0.024-inch (0.61-mm)][aluminum, 0.031-inch (0.79-mm)][or][anodized aluminum, 0.031-inch (0.79-mm)]** minimum thickness, with predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass **[wire][link chain][or][beaded chain][or][S-hook].**

- D. Letter and Background Color: As indicated for specific application under Part 3.
- E. Valve Schedules: For each piping system, on **8-1/2-by-11-inch (A4)** bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Include valve-tag schedule in operation and maintenance data.

2.7 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[Brady Corporation]**
 - 2. **[Champion America]**
 - 3. **[Craftmark Pipe Markers]**
 - 4. **[emedco]**
 - 5. **[Kolbi Pipe Marker Co.]**
 - 6. **[LEM Products Inc.]**
 - 7. **[Marking Services Inc.]**
 - 8. **[Pipemarker.com; Brimar Industries, Inc.]**
 - 9. **[Seton Identification Products; a Brady Corporation company]**
 - 10. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Brady Corporation]**
 - 2. **[Champion America]**
 - 3. **[Craftmark Pipe Markers]**
 - 4. **[emedco]**
 - 5. **[Kolbi Pipe Marker Co.]**
 - 6. **[LEM Products Inc.]**
 - 7. **[Marking Services Inc.]**
 - 8. **[Pipemarker.com; Brimar Industries, Inc.]**
 - 9. **[Seton Identification Products; a Brady Corporation company]**
 - 10. **<Insert manufacturer's name>**
- C. Description: Preprinted**[or partially preprinted]** accident-prevention tags of plasticized card stock**[with matte finish suitable for writing]**.
 - 1. Size: **[3 by 5-1/4 inches (75 by 133 mm) minimum][Approximately 4 by 7 inches (100 by 178 mm)]<Insert size>**.
 - 2. Fasteners: **[Brass grommet and wire][Reinforced grommet and wire or string]**.
 - 3. Nomenclature: Large-size primary caption, such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

- A. Permanently fasten labels on each item of plumbing equipment.
- B. Sign and Label Colors.
 - 1. **[White letters on an ANSI Z535.1 safety-green background]<Insert colors>.**
- C. Locate equipment labels where accessible and visible.
- D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where are-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E[, **and other applicable codes and standards**].

3.4 INSTALLATION OF WARNING TAPE

- A. Warning Tape Color and Pattern: **[Yellow background with black diagonal stripes]<Insert color, marking pattern, text>.**
- B. Install warning tape on pipes and ducts, with cross-designated walkways providing less than **6 ft. (2 m)** of clearance.
- C. Locate tape so as to be readily visible from the point of normal approach.

3.5 INSTALLATION OF PIPE LABELS

- A. Piping Color Coding: Painting of piping is specified in **[Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]**
- B. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- C. Stenciled Pipe Label Option: Stenciled labels showing service and flow direction may be provided

instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, [**with painted, color-coded bands or rectangles**] on each piping system.

1. Identification Paint: Use for contrasting background.
 2. Stencil Paint: Use for pipe marking.
- D. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Within **3 ft. (1 m)** of each valve and control device.
 2. At access doors, manholes, and similar access points that permit view of concealed piping.
 3. Within **3 ft. (1 m)** of equipment items and other points of origination and termination.
 4. Spaced at maximum intervals of **[25 ft. (8 m)]<Insert dimension>** along each run. Reduce intervals to **[10 ft. (3 m)]<Insert dimension>** in areas of congested piping and equipment.
- E. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of **125 deg F (52 deg C)** or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.
- F. Flow-Direction Flow Arrows: Use arrows, in compliance with ASME A13.1, to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- G. Pipe-Label Color Schedule:
1. Low-Pressure Compressed-Air Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 2. High-Pressure Compressed-Air Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 3. Vacuum Piping: **[White letters on an ANSI Z535.1 Safety blue background.]<Insert colors.>**
 4. Domestic Cold-Water Piping: **[White letters on an ANSI Z535.1 safety-green background]<Insert colors>**.
 5. Domestic Hot-Water Piping: **[White letters on an ANSI Z535.1 safety-green background]<Insert colors.>**
 6. Domestic Hot-Water Return Piping **[White letters on an ANSI Z535.1 safety-green background]<Insert colors>**.
 7. **[Sanitary Waste][and][Storm Drainage]** Piping: **[White letters on a black background]<Insert colors>**.
 8. Nonpotable Cold Water: **[Black letters on an ANSI Z535.1 safety-yellow background]<Insert colors>**.
 9. Nonpotable Hot Water: **[Black letters on an ANSI Z535.1-yellow background]<Insert colors>**.
 10. Nonpotable Hot-Water Recirculation: **[Black letters on an ANSI Z535.1 safety-yellow background]<Insert colors>**.
 11. Reagent Water Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 12. Deionized Water Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 13. Distilled Water Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 14. Reverse Osmosis Water Piping: **[White letters on an ANSI Z535.1 safety-blue background]<Insert colors>**.
 15. **<Insert additional systems and colors as required>**.

3.6 INSTALLATION OF VALVE TAGS

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
 1. Valve-Tag Size and Shape:
 - a. Domestic Cold Water: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - b. Domestic Hot Water: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - c. Domestic Hot-Water Return: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - d. Low-Pressure Compressed Air: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - e. High-Pressure Compressed Air: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - f. Nonpotable Cold Water: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - g. Nonpotable Hot Water: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - h. Nonpotable Hot-Water Return: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - i. Reagent Water Piping: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - j. Deionized Water Piping: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - k. Distilled Water Piping: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - l. Reverse Osmosis Water Piping: [1-1/2 inches (38 mm)][2 inches (50 mm)], [round][square]<Insert shape>.
 - m. <Insert additional systems>.
 2. Valve-Tag Colors:
 - a. For each piping system, use the same lettering and background coloring system on valve tags as used in the piping system labels and background.

3.7 INSTALLATION OF WARNING TAGS

- A. Warning Tag Color: [Black letters on an ANSI Z535.1 safety-yellow background]<Insert color>.
- B. Attach warning tags, with proper message, to equipment and other items where [indicated on Drawings][scheduled].

END OF SECTION 22 05 53 00

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Task	Specification	Specification Description
22 05 53 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 05 76 00 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-purpose roof drains.
2. Promenade roof drains.
3. Deck roof drains.
4. Miscellaneous storm drainage piping specialties.
5. Cleanouts.
6. Backwater valves.
7. Trench drains.
8. Concrete trench drain-forming system.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for penetrations of roofs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GENERAL-PURPOSE ROOF DRAINS

A. Roof Drains, General Purpose - Cast Iron:

1. Roof Drain, General Purpose - Cast Iron, Large Sump :
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Eric'sons]**
 - 2) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 3) **[Josam Company]**
 - 4) **[Marathon Roofing Products]**
 - 5) **[MIFAB, Inc]**
 - 6) **[Sioux Chief Manufacturing Company, Inc.]**
 - 7) **[Wade; a subsidiary of McWane Inc.]**
 - 8) **[WATTS; A Watts Water Technologies Company]**
 - 9) **[Zurn Industries, LLC]**
 - 10) **<Insert manufacturer's name>**



- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[Eric'sons]**
 - 2) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 3) **[Josam Company]**
 - 4) **[Marathon Roofing Products]**
 - 5) **[MIFAB, Inc]**
 - 6) **[Sioux Chief Manufacturing Company, Inc.]**
 - 7) **[Wade; a subsidiary of McWane Inc.]**
 - 8) **[WATTS; A Watts Water Technologies Company]**
 - 9) **[Zurn Industries, LLC]**
 - 10) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain cast-iron roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: Cast iron.
- f. Dimension of Body: Nominal **[14-to 16-inch (357- to 406-mm)]<Insert dimension>** diameter.
- g. Dome Material: **[Aluminum][Cast iron][PE][Bronze]<Insert material>**.
- h. Combination flashing ring and gravel stop.
- i. Outlet: **[Bottom][Side]<Insert location>**.
- j. Outlet Type: **[No-hub][Inside caulk][Threaded]<Insert type>**.
- k. Options:
- 1) Flow-control weirs.
 - 2) Extension collars.
 - 3) Underdeck clamp.
 - 4) Expansion joint.
 - 5) Sump receiver plate.
 - 6) Perforated Gravel Guard: Stainless steel.
 - 7) Vandal-proof dome.
 - 8) Water Dam: **[2 inches (50 mm) high]<Insert height>**.
 - 9) **<Insert option>**.
2. Roof Drain, General Purpose - Cast Iron, Medium Sump :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[Marathon Roofing Products]**
 - 3) **[MIFAB, Inc]**
 - 4) **[Portals Plus; Duravent Group]**
 - 5) **[Sioux Chief Manufacturing Company, Inc.]**
 - 6) **[Wade; a subsidiary of McWane Inc.]**
 - 7) **[Zurn Industries, LLC]**
 - 8) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [Marathon Roofing Products]
 - 3) [MIFAB, Inc]
 - 4) [Portals Plus; Duravent Group]
 - 5) [Sioux Chief Manufacturing Company, Inc.]
 - 6) [Wade; a subsidiary of McWane Inc.]
 - 7) [Zurn Industries, LLC]
 - 8) <Insert manufacturer's name>
- c. Source Limitations: Obtain cast-iron, medium-sump, general-purpose roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: Cast iron.
- f. Dimension of Body: [8- to 12-inch (203- to 305-mm)]<Insert dimension> diameter.
- g. Dome Material: [Aluminum][Cast iron][PE][Bronze]<Insert material>.
- h. Combination flashing ring and gravel stop.
- i. Outlet: [Bottom][Side]<Insert location>.
- j. Outlet Type: [No-hub][Inside caulk][Threaded]<Insert type>.
- k. Options:
- 1) Flow-control weirs.
 - 2) Extension collars.
 - 3) Underdeck clamp.
 - 4) Expansion joint.
 - 5) Sump receiver plate.
 - 6) Wire Mesh: Stainless steel or brass over dome.
 - 7) Perforated Gravel Guard: Stainless steel.
 - 8) Vandal-proof dome.
 - 9) Water Dam: [2 inches (50 mm) high]<Insert height>.
 - 10) <Insert option>.
3. Roof Drain, General Purpose - Cast Iron, Small Sump :
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [Marathon Roofing Products]
 - 3) [MIFAB, Inc]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [Marathon Roofing Products]
 - 3) [MIFAB, Inc]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>

- c. Source Limitations: Obtain cast-iron, small-sump, general-purpose roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Cast iron.
 - f. Dimension of Body: Nominal **[8-inch (203-mm)]<Insert dimension>** diameter.
 - g. Dome Material: **[Cast iron]<Insert material>**.
 - h. Combination flashing ring and gravel stop.
 - i. Outlet: **[Bottom][Side]<Insert location>**.
 - j. Outlet Type: **[No-hub][Inside caulk][Threaded]<Insert type>**.
 - k. Options:
 - 1) Extension collars.
 - 2) Underdeck clamp.
 - 3) Expansion joint.
 - 4) Sump receiver plate.
 - 5) Wire Mesh: Stainless steel or brass over dome.
 - 6) Vandal-proof dome.
 - 7) **<Insert option>**.
4. Roof Drain, Cornice and Gutter Type - Cast Iron :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[Marathon Roofing Products]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[Marathon Roofing Products]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain cast-iron cornice and gutter roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Cast iron.
 - f. Dimension of Body: Nominal **6-inch (152-mm)** diameter.
 - g. Dome Material: **[Bronze]<Insert material and finish>**.
 - h. Outlet: **[Bottom][Side][45-degree angle]**.
 - i. Outlet Type: **[Threaded]<Insert type>**.
 - j. Options:
 - 1) Wire Mesh: Stainless steel or brass over dome.

- 2) Vandal-proof dome.
- 3) **<Insert option>.**

5. Roof Drain, Parapet - Cast Iron :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain cast-iron parapet roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: Cast iron.
- f. Grate Material: **[Bronze][Cast iron][Nickel-bronze alloy]<Insert material>.**
- g. Outlet: **[Back][Angle]<Insert location>.**
- h. Outlet Type: **[Threaded]<Insert type>.**
- i. Options:
 - 1) Wire Mesh: Stainless steel or brass over grate.
 - 2) Vandal-proof grate.
 - 3) **<Insert option>.**

B. Roof Drains, General Purpose - Copper:

1. Roof Drain, General Purpose - Copper, Medium Sump :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Marathon Roofing Products]**
 - 2) **[Menzies Metal Products]**
 - 3) **[OMG Roofing Products; a Division of OMG, Inc.]**
 - 4) **[Thaler Metal Industries Ltd.]**
 - 5) **[Thunderbird Products]**
 - 6) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Marathon Roofing Products]**
 - 2) **[Menzies Metal Products]**
 - 3) **[OMG Roofing Products; a Division of OMG, Inc.]**
 - 4) **[Thaler Metal Industries Ltd.]**
 - 5) **[Thunderbird Products]**
 - 6) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain copper, medium-sump, general-purpose roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Drain Body and Flange Material: Copper.
 - f. Dimension of Body: **[8- to 12-inch (203- to 305-mm)]<Insert dimension>** diameter.
 - g. Dome Material: **[Aluminum]<Insert material>**.
 - h. Combination flashing ring and gravel stop.
 - i. Outlet: **[Bottom][Side]<Insert location>**.
 - j. Outlet Type: **[Threaded]<Insert type>**.
 - k. Options:
 - 1) Extension collars.
 - 2) Underdeck clamp.
 - 3) Expansion joint.
 - 4) Sump receiver plate.
 - 5) Wire Mesh: Stainless steel or brass over dome.
 - 6) Perforated Gravel Guard: Stainless steel.
 - 7) Vandal-proof dome.
 - 8) Water Dam: **[2 inches (50 mm) high]<Insert height>**.
 - 9) **<Insert option>**.
2. Roof Drain, General Purpose - Copper, Small Sump :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Menzies Metal Products]**
 - 2) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Menzies Metal Products]**
 - 2) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain copper, small-sump, general-purpose roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Copper.
 - f. Dimension of Body: Nominal **[8-inch (203-mm)]<Insert dimension>** diameter.
 - g. Dome Material: **[Aluminum]<Insert material>**.

- h. Outlet: **[Bottom]<Insert location>**.
- i. Outlet Type: **[O-ring]<Insert type>**.
- j. Options:
 - 1) Vandal-proof dome.
 - 2) **<Insert option>**.

C. Roof Drain, General Purpose - Aluminum:

1. Roof Drain, General-Purpose - Aluminum :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Menzies Metal Products]**
 - 2) **[OMG Roofing Products; a Division of OMG, Inc.]**
 - 3) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Menzies Metal Products]**
 - 2) **[OMG Roofing Products; a Division of OMG, Inc.]**
 - 3) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain aluminum, general-purpose roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: Aluminum.
- f. Dimension of Body: Nominal **[6-inch (150-mm)]<Insert dimension>** diameter.
- g. Dome Material: Aluminum.
- h. Outlet: **[Bottom]<Insert location>**.
- i. Outlet Type: **[O-ring or mechanical seal]<Insert type>**.
- j. Options:
 - 1) Vandal-proof dome.
 - 2) **<Insert option>**.

D. Roof Drain, General Purpose - Plastic:

1. Roof Drain, General-Purpose - Plastic :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[LSP Products Group]**
 - 2) **[Marathon Roofing Products]**
 - 3) **[Plastic Oddities]**
 - 4) **[Portals Plus; Duravent Group]**
 - 5) **[Sioux Chief Manufacturing Company, Inc.]**
 - 6) **[Town & Country Plastics, Inc]**



- 7) **[Zurn Industries, LLC]**
 - 8) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[LSP Products Group]**
 - 2) **[Marathon Roofing Products]**
 - 3) **[Plastic Oddities]**
 - 4) **[Portals Plus; Duravent Group]**
 - 5) **[Sioux Chief Manufacturing Company, Inc.]**
 - 6) **[Town & Country Plastics, Inc]**
 - 7) **[Zurn Industries, LLC]**
 - 8) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain plastic general-purpose roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: **[ABS][or][PVC]<Insert material>**.
- f. Sump Diameter: **<Insert nominal dimension>**.
- g. Dome Material: **[Aluminum][Cast iron][Plastic]<Insert material>**.
- h. Outlet: **[Bottom]<Insert location>**.
- i. Outlet Type: **<Insert type>**.
- j. Options:
- 1) Combination flashing ring and gravel stop.
 - 2) Extension collars.
 - 3) Underdeck clamp.
 - 4) Expansion joint.
 - 5) Sump receiver plate.
 - 6) Vandal-proof dome.
 - 7) **<Insert option>**.

2.2 PROMENADE ROOF DRAINS

A. Roof Drain, Promenade - Cast Iron:

1. Roof Drain, Promenade Type - Cast Iron, Large Sump :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [MIFAB, Inc]
 - 3) [Wade; a subsidiary of McWane Inc.]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
 - c. Source Limitations: Obtain cast-iron, large-sump, promenade roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Cast iron.
 - f. Dimension of Body: Nominal [12- to 14-inch (305- to 357-mm)]<Insert dimension> diameter.
 - g. Dimension of Frame and Grate: Nominal [12 to 14 inches (305 to 357 mm)]<Insert dimension> square.
 - h. Grate Material: [Bronze][Cast iron][Nickel-bronze alloy]<Insert material>.
 - i. Outlet: [Bottom][Side].
 - j. Outlet Type: [No-hub][Inside caulk][Threaded]<Insert type>.
 - k. Options:
 - 1) Extension collars.
 - 2) Underdeck clamp.
 - 3) Expansion joint.
 - 4) Sump receiver plate.
 - 5) Vandal-proof grate.
 - 6) <Insert option>.
2. Roof Drain, Promenade Type - Cast Iron, Medium Sump :
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [MIFAB, Inc]
 - 3) [Wade; a subsidiary of McWane Inc.]
 - 4) [Zurn Industries, LLC]
 - 5) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [MIFAB, Inc]
 - 3) [Wade; a subsidiary of McWane Inc.]
 - 4) [Zurn Industries, LLC]
 - 5) <Insert manufacturer's name>
 - c. Source Limitations: Obtain cast-iron, medium-sump, promenade roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Cast iron.
 - f. Dimension of Body: [11- to 12-inch (280- to 305-mm)]<Insert dimension> diameter.
 - g. Dimension of Frame and Grate: Nominal [12 inches (305 mm)]<Insert dimension>

- square.
- h. Grate Material: **[Bronze][Cast iron][Nickel-bronze alloy]<Insert material>**.
 - i. Outlet: **[Bottom][Side]**.
 - j. Outlet Type: **[No-hub][Inside caulk][Threaded]<Insert type>**.
 - k. Options:
 - 1) Extension collars.
 - 2) Underdeck clamp.
 - 3) Expansion joint.
 - 4) Sump receiver plate.
 - 5) Vandal-proof grate.
 - 6) **<Insert option>**.
3. Roof Drain, Promenade Type - Cast Iron, Small Sump :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain cast-iron, small-sump, promenade roof drains from single manufacturer.
 - d. Standard: ASME A112.6.4.
 - e. Body Material: Cast iron.
 - f. Dimension of Body: Nominal **[8-inch (203-mm)]<Insert dimension>** diameter.
 - g. Dimension of Frame and Grate: Nominal **[8 inches (203 mm)]<Insert dimension>** square.
 - h. Grate Material: **[Bronze][Cast iron][Nickel-bronze alloy]<Insert material>**.
 - i. Outlet: Bottom.
 - j. Outlet Type: **[No-hub][Inside caulk][Threaded]<Insert type>**.
 - k. Options:
 - 1) Extension collars.
 - 2) Underdeck clamp.
 - 3) Expansion joint.
 - 4) Sump receiver plate.
 - 5) Vandal-proof grate.
 - 6) **<Insert option>**.

2.3 DECK ROOF DRAINS

A. Roof Drain, Deck - Cast Iron:

1. Roof Drain, Deck Type - Cast Iron, Medium Sump :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- 2) **[MIFAB, Inc]**
- 3) **[WATTS; A Watts Water Technologies Company]**
- 4) **[Zurn Industries, LLC]**
- 5) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- 2) **[MIFAB, Inc]**
- 3) **[WATTS; A Watts Water Technologies Company]**
- 4) **[Zurn Industries, LLC]**
- 5) **<Insert manufacturer's name>**

- c. Source Limitations: Obtain cast-iron, medium-sump, deck roof drains from single manufacturer.

- d. Standard: ASME A112.6.4.

- e. Body Material: Cast iron.

- f. Overall Dimension of Frame and Grate: Nominal **[12 to 14 inches (305 to 357 mm)]<Insert dimension>[round][square]**.

- g. Top-Loading Classification: **[Heavy Duty]<Insert duty>**.

- h. Grate Material: **[Cast or ductile iron]<Insert material>**.

- i. Flange: **[Anchor][Anchor with weep holes][Not required]**.

- j. Outlet: **[Bottom][Side]<Insert location>**.

- k. Outlet Type: **[No-hub][Inside caulk][Threaded]<Insert type>**.

- l. Options:

- 1) Clamping device.
- 2) Backwater valve.
- 3) Grate Finish: **<Insert finish>**.
- 4) Vandal-proof frame and grate.
- 5) **<Insert option>**.

2. Roof Drain, Deck Type - Metal, Small Sump :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- 1) **[Menzies Metal Products]**
- 2) **[MIFAB, Inc]**
- 3) **[Thunderbird Products]**



- 4) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) **[Menzies Metal Products]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Thunderbird Products]**
 - 4) <Insert manufacturer's name>
- c. Source Limitations: Obtain metal, small-sump, deck roof drains from single manufacturer.
- d. Standard: ASME A112.6.4.
- e. Body Material: **[Cast iron][or][Copper]**
- f. Overall Dimension of Frame and Grate: Nominal **[8 inches (203 mm)]**<Insert dimension>**[round][square]**.
- g. Top-Loading Classification: <Insert duty>.
- h. Grate Material: **[Cast or ductile iron]**<Insert material>.
- i. Flange: **[Anchor][Anchor with weep holes][Not required]**.
- j. Outlet: **[Bottom][Side]**<Insert location>.
- k. Outlet Type: **[No-hub][Inside caulk][Threaded]**<Insert type>.
- l. Options:
 - 1) Clamping device.
 - 2) Grate Finish: <Insert finish>.
 - 3) Vandal-proof frame and grate.
 - 4) <Insert option>.

2.4 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adapter :

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boot :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[J.R. Hoe & Sons Inc.]**
 - b. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - c. **[Neenah Foundry Company]**
 - d. **[Wade; a subsidiary of McWane Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [J.R. Hoe & Sons Inc.]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Neenah Foundry Company]
 - d. [Wade; a subsidiary of McWane Inc.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Zurn Industries, LLC]
 - g. <Insert manufacturer's name>
 3. Source Limitations: Obtain downspout boots from single manufacturer.
 4. Description: Manufactured, ASTM A48/A48M, gray-iron casting, with strap or ears for attaching to building; **NPS 4 (DN 100)** outlet; and shop-applied bituminous coating.
 5. Size: Inlet size to match downspout and **NPS 4 (DN 100)** outlet.
- C. Downspout Nozzle - Metal :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Wade; a subsidiary of McWane Inc.]
 - c. [WATTS; A Watts Water Technologies Company]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert **manufacturer's name; product name or designation**> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Wade; a subsidiary of McWane Inc.]
 - c. [WATTS; A Watts Water Technologies Company]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
 3. Source Limitations: Obtain metal downspout nozzles from single manufacturer.
 4. Description: Nozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
 5. Size: Same as connected downspout.
 6. Material: Cast bronze or nickel bronze nozzle and flange.
 7. Piping Connection Type: **[Threaded][No-hub][or][slip on]**.
 8. Finish: **<Insert type>**.
 9. Opening Protection: **[Birdscreen][None]**.
- D. Downspout Nozzle - Metal, with PVC Insert :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [RectorSeal Plumbing; A CSW Industrials Company]
 - b. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[RectorSeal Plumbing; A CSW Industrials Company]**
- b. **<Insert manufacturer's name>**

- 3. Source Limitations: Obtain metal downspout nozzles with PVC insert from single manufacturer.
- 4. Description: Nozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
- 5. Size: Same as connected downspout.
- 6. Material: Cast nickel brass, with integral PVC insert.
- 7. Piping Connection Type: Solvent welded.
- 8. Finish: Nickel brass.
- 9. Opening Protection: **[Birdscreen][None]**.

E. Downspout Nozzle - Polymer :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[RectorSeal Plumbing; A CSW Industrials Company]**
 - b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[RectorSeal Plumbing; A CSW Industrials Company]**
 - b. **<Insert manufacturer's name>**
- 3. Source Limitations: Obtain polymer downspout nozzles from single manufacturer.
- 4. Description: Nozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
- 5. Size: Same as connected downspout.
- 6. Material: High-impact, marine-grade polymer.
- 7. Piping Connection Type: Solvent welded.
- 8. Finish: Simulated oil-rubbed bronze.

2.5 CLEANOUTS

A. Cast-Iron Cleanouts:

- 1. Cleanout, Exposed Type - Cast Iron :
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**

- 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain cast-iron exposed cleanouts from single manufacturer.
- d. Standard: ASME A112.36.2M.
- e. Size: Same as connected branch.
- f. Body Material: **[Hub-and-spigot, cast-iron soil pipe T-branch][No-hub, cast-iron soil pipe test tee]** as required to match connected piping.
- g. Closure: **[Countersunk][Countersunk or raised-head][Raised head], [brass][cast-iron][plastic]** plug.
- h. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.
2. Cleanout, Exposed Floor Type - Cast Iron :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[Sioux Chief Manufacturing Company, Inc.]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[Sioux Chief Manufacturing Company, Inc.]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain cast-iron exposed floor cleanouts from single manufacturer.
- d. Standard: ASME A112.36.2M.
- e. Size: Same as connected branch.
- f. Type: **[Adjustable housing][Cast-iron soil pipe with cast-iron ferrule][Heavy-duty, adjustable housing][Threaded, adjustable housing]**.
- g. Body or Ferrule: Cast iron.
- h. Outlet Connection: **[No-hub][Hub with inside caulk][Hub with gasket][Threaded]**.



- i. Closure: **[Brass plug with straight threads and gasket][Brass plug with tapered threads][Cast-iron plug][Plastic plug]**.
 - j. Adjustable Housing Material: **[Cast iron][Plastic]<Insert material>** with **[threads][setscrews or other device]**.
 - k. Frame and Cover Material and Finish: **[Nickel-bronze, copper alloy][Painted cast iron][Polished bronze][Rough bronze]<Insert material and finish>**.
 - l. Frame and Cover Shape: **[Round][Square]<Insert shape>**.
 - m. Top Loading Classification: **[Extra-Heavy][Heavy][Light][Medium]** Duty.
 - n. Riser: ASTM A74, **[Extra-Heavy][Service]** Class, cast-iron drainage pipe fitting and riser to cleanout.
 - o. Options:
 - 1) Clamping device.
 - 2) **<Insert option>**.
3. Cleanout, Wall Type - Cast Iron :
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[MIFAB, Inc]**
 - 3) **[Wade; a subsidiary of McWane Inc.]**
 - 4) **[WATTS; A Watts Water Technologies Company]**
 - 5) **[Zurn Industries, LLC]**
 - 6) **<Insert manufacturer's name>**
 - c. Source Limitations: Obtain cast-iron wall cleanouts from single manufacturer.
 - d. Standard: ASME A112.36.2M. Include wall access.
 - e. Size: Same as connected drainage piping.
 - f. Body: **[Hub-and-spigot, cast-iron soil pipe T-branch][No-hub, cast-iron soil pipe test tee]** as required to match connected piping.
 - g. Closure Plug:
 - 1) Material: **[Brass][Cast iron]**.
 - 2) Head: **[Countersunk][or][raised]**.
 - 3) Drilled and threaded for cover attachment screw.
 - 4) Size: Same as, or not more than, one size smaller than cleanout size.
 - h. Wall-Access Cover Plate: Round, **[deep, chrome-plated bronze][flat, chrome-plated brass or stainless steel]** cover plate with screw.
 - i. Wall-Access Frame and Cover: **[Round][Square]**, **[nickel-bronze, copper-alloy, or**

stainless steel]<Insert material> wall-installation frame and cover.

4. Test Tee - Cast Iron :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- 2) **[MIFAB, Inc]**
- 3) **[Tyler Pipe; a subsidiary of McWane Inc.]**
- 4) **[WATTS; A Watts Water Technologies Company]**
- 5) **[Zurn Industries, LLC]**
- 6) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- 2) **[MIFAB, Inc]**
- 3) **[Tyler Pipe; a subsidiary of McWane Inc.]**
- 4) **[WATTS; A Watts Water Technologies Company]**
- 5) **[Zurn Industries, LLC]**
- 6) **<Insert manufacturer's name>**

- c. Source Limitations: Obtain cast-iron test tees from single manufacturer.
- d. Standard: ASME A112.36.2M and ASTM A74, ASTM A888, or CISPI 301.
- e. Size: Same as connected drainage piping.
- f. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or no-hub, cast-iron soil-pipe test tee as required to match connected piping.
- g. Closure Plug: **[Countersunk][or][raised head], [brass]<Insert material>**.
- h. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

B. Cleanouts - Plastic:

1. Cleanout - Plastic :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) **[Canplas Industries Ltd.]**
- 2) **[IPS Corporation]**
- 3) **[Plastic Oddities]**
- 4) **[Sioux Chief Manufacturing Company, Inc.]**
- 5) **[Zurn Industries, LLC]**
- 6) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Canplas Industries Ltd.]**

- 2) [IPS Corporation]
 - 3) [Plastic Oddities]
 - 4) [Sioux Chief Manufacturing Company, Inc.]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- c. Source Limitations: Obtain plastic cleanouts from single manufacturer.
 - d. Size: Same as connected branch.
 - e. Body Material: [PVC][ABS].
 - f. Closure Plug: [PVC][ABS]<Insert type>.
 - g. Type: [Wall][and][floor].
 - h. Frame and Cover Material and Finish: [Nickel-bronze, copper alloy][Polished bronze][Rough bronze]<Insert material and finish>.
 - i. Frame and Cover Shape: [Round][Square]<Insert shape>.
 - j. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.6 BACKWATER VALVES

A. Backwater Valves - Cast Iron:

1. Backwater Valve - Cast Iron, Horizontal :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [MIFAB, Inc]
 - 3) [Wade; a subsidiary of McWane Inc.]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Jay R. Smith Mfg Co; a division of Morris Group International]
 - 2) [MIFAB, Inc]
 - 3) [Wade; a subsidiary of McWane Inc.]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- c. Source Limitations: Obtain cast-iron, horizontal backwater valves from single manufacturer.
- d. Standard: ASME A112.14.1.
- e. Size: Same as connected piping.
- f. Body Material: Cast iron.
- g. Cover: Cast iron with [bolted][or][threaded] to access check valve.
- h. End Connections: Hub and spigot or no-hub.
- i. Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang [closed][open for airflow unless subject to backflow condition].
- j. Extension: ASTM A74, Service Class; full-size, cast-iron soil-pipe extension to field-

installed cleanout at floor; replaces backwater valve cover.

2. Backwater Valve - Cast Iron, Drain Outlet :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[WATTS; A Watts Water Technologies Company]**
 - 3) **[Zurn Industries, LLC]**
 - 4) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - 2) **[WATTS; A Watts Water Technologies Company]**
 - 3) **[Zurn Industries, LLC]**
 - 4) **<Insert manufacturer's name>**
- c. Source Limitations: Obtain cast-iron, drain-outlet backwater valves from single manufacturer.
- d. Standard: ASME A112.14.1.
- e. Size: Same as floor drain outlet.
- f. Body Material: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
- g. Check Valve: Removable ball float.
- h. Inlet: Threaded or no-hub.
- i. Outlet: Threaded, no-hub, or spigot.

B. Backwater Valves - Plastic, Horizontal:

1. Backwater Valve - Plastic, Horizontal :

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Canplas Industries Ltd.]**
 - 2) **[IPS Corporation]**
 - 3) **[NDS Inc]**
 - 4) **[Oatey Co.]**
 - 5) **[Plastic Oddities]**
 - 6) **[RectorSeal Plumbing; A CSW Industrials Company]**
 - 7) **[Sioux Chief Manufacturing Company, Inc.]**
 - 8) **[Zurn Industries, LLC]**
 - 9) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) [Canplas Industries Ltd.]
- 2) [IPS Corporation]
- 3) [NDS Inc]
- 4) [Oatey Co.]
- 5) [Plastic Oddities]
- 6) [RectorSeal Plumbing; A CSW Industrials Company]
- 7) [Sioux Chief Manufacturing Company, Inc.]
- 8) [Zurn Industries, LLC]
- 9) <Insert manufacturer's name>

- c. Source Limitations: Obtain plastic, horizontal backwater valves from single manufacturer.
- d. Standard: ASME A112.14.1.
- e. Size: Same as connected piping.
- f. Body Material: [ABS][PVC].
- g. Cover: Same material as body with threaded access to check valve.
- h. Check Valve: Removable swing check.
- i. End Connections: Socket type.

2.7 TRENCH DRAINS

A. Trench Drain :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Zurn Industries, LLC]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Zurn Industries, LLC]
 - d. <Insert manufacturer's name>
3. Source Limitations: Obtain trench drains from single manufacturer.
4. Standard: ASME A112.6.3.
5. Body Material: [Cast iron]<Insert material>.
6. Dimensions of Frame and Grate: <Insert dimensions: Include those for body, sump, and grate if required>.
7. Top-Loading Classification: [Extra-Heavy][Heavy][Light][Medium] Duty.
8. Grate Material: [Ductile iron][Cast iron][or][stainless steel]<Insert material>.
9. Grate Finish: [Painted][Not required]<Insert finish>.
10. Flange: [Anchor][Seepage][Not required].
11. Outlet: [Bottom][End][Side]<Insert location>.
12. Outlet Type: [Inside caulk]<Insert type>.
13. Options:

- a. Clamping device.
 - b. <Insert option>.
- B. Trench Drain, Modular Channel System - Polymer Concrete, Narrow, Sloped Invert :
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[MultiDrain Systems, Inc.]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[MultiDrain Systems, Inc.]**
 - g. **<Insert manufacturer's name>**
 - 3. Source Limitations: Obtain narrow, sloped-invert, polymer-concrete, channel drainage systems from single manufacturer.
 - 4. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - 5. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated.
 - b. Include extension sections necessary for required depth.
 - c. Dimensions: **[4-inch (102-mm)]<Insert dimension>** inside width. Include number of units required to form total lengths indicated.
 - d. Frame: **[Gray-iron, cast iron, or galvanized steel for grates][Not required]<Insert material>**.
 - 6. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Cast iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
 - 7. Covers: Solid **[ductile or cast iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - 8. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

C. Trench Drain, Modular Channel System - Polymer Concrete, Narrow, Level Invert :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[Josam Company]**
 - g. **[MultiDrain Systems, Inc.]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[Josam Company]**
 - g. **[MultiDrain Systems, Inc.]**
 - h. **<Insert manufacturer's name>**
3. Source Limitations: Obtain narrow, level-invert, polymer-concrete, channel drainage systems from single manufacturer.
4. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
5. Channel Sections: Narrow, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - b. Dimensions: **[5-inch (127-mm)]<Insert dimension>** inside width and **[9-3/4-inch (248-mm)]<Insert dimension>** inside depth. Include number of units required to form total lengths indicated.
 - c. Frame: **[Galvanized steel or cast iron for grates][Not required]<Insert material>**.
6. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Cast iron or gray iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
7. Covers: Solid **[ductile, cast, or gray iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.

8. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

D. Trench Drain, Modular Channel System - Polymer Concrete, Wide, Level Invert :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain wide, level-invert, polymer-concrete, channel drainage systems from single manufacturer.
4. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
5. Channel Sections: Wide, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include flat or rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - b. Dimensions: **[8-inch (203-mm)]<Insert dimension>** inside width and **[13-3/4-inch (350-mm)]<Insert dimension>** inside depth. Include number of units required to form total lengths indicated.
 - c. Frame: **[Galvanized steel, gray iron, or cast iron for grates][Not required]<Insert material>**.
6. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Cast iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
7. Covers: Solid **[ductile or cast iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
8. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.8 CONCRETE TRENCH DRAIN-FORMING SYSTEM

A. Concrete Trench Drain-Forming System :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[MultiDrain Systems, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[MultiDrain Systems, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtain concrete trench drain-forming system from single manufacturer.
4. Description: Radius trench drain-forming system including a removable form that is customizable for width, depth, length, shape, slope, frame material, and grate material.
5. Form Bottom: **[Smooth radius][Vee][Flat]<Insert option>**.
6. Form Use: **[Single use][or][reusable]**.
7. Form Covers: Plywood or metal to keep concrete out of trench form during installation.
8. Width: **[8-inch (203-mm)][10-inch (254-mm)][12-inch (305-mm)][18-inch (457-mm)][24-inch (610-mm)]<Insert width>** inside dimension.
9. Depth: **[See Drawings]<Insert dimension>**.
10. Length: **[See Drawings]<Insert dimension>**.
11. Bottom Shape: **[Smooth radius][Vee]<Insert shape>**.
12. Slope: **[Level - no slope][0.5 percent][0.6 percent][1.0 percent]<Insert slope>**.
13. Frame/Grate Seat:
 - a. Load Bearing, **<Insert loading requirement>**.
 - b. Material: **[Powder-coated steel][Galvanized steel][Iron][Aluminum][Plastic][FRP][Stainless steel]<Insert material>**.
14. Concrete Anchors: **[18 inches (457 mm) o.c.]<Insert spacing>**.
15. Grate:
 - a. Manufacturer's Load Bearing Designation: **"[Heavy][Medium] Duty."**
 - b. Material: **[Ductile iron][FRP][Galvanized steel][Cast iron][Stainless steel]<Insert material>**.
 - c. Grate Type: **[ADA][Heel-proof][slotted][perforated][bar]<Insert grate type>**.

PART 3 - EXECUTION

3.1 INSTALLATION OF GENERAL-PURPOSE ROOF DRAINS

- A. Install general-purpose roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.
 - 1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
 - 2. Install expansion joints, if indicated, in roof drain outlets.
 - 3. Position roof drains for easy access and maintenance.
- B. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
- D. Set flashing on roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF PROMENADE ROOF DRAINS

- A. Install promenade roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.
 - 1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
 - 2. Install expansion joints, if indicated, in roof drain outlets.
 - 3. Position roof drains for easy access and maintenance.
- B. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
- D. Set flashing on roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.3 INSTALLATION OF DECK ROOF DRAINS

- A. Install deck roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.
 - 1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
 - 2. Install expansion joints, if indicated, in roof drain outlets.
 - 3. Position roof drains for easy access and maintenance.
- B. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
- D. Set flashing on roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

- A. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.
- B. Install downspout boots at grade with top **[6 inches (152 mm)][12 inches (305 mm)][18 inches (457 mm)]<Insert dimension>** above grade. Secure to building wall.
- C. Install downspout nozzles at exposed bottom of conductors where they spill onto grade.

3.5 INSTALLATION OF CLEANOUTS

- A. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:
 - 1. Use cleanouts the same size as drainage piping up to **NPS 4 (DN 100)**. Use **NPS 4 (DN 100)** for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 - 3. Locate cleanouts at minimum intervals of **[50 ft. (15 m)]<Insert dimension>** for piping **NPS 4 (DN 100)** and smaller and **100 ft. (30 m)** for larger piping.
 - 4. Locate cleanouts at base of each vertical storm piping conductor.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

- E. Install test tees in vertical conductors and near floor.

3.6 INSTALLATION OF BACKWATER VALVES

- A. Install horizontal backwater valves in floor with cover flush with floor.
- B. Install drain-outlet backwater valves in outlet of drains.

3.7 INSTALLATION OF TRENCH DRAINS

- A. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.
- B. Assemble channel drainage system components in accordance with manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

3.8 INSTALLATION OF CONCRETE TRENCH DRAIN-FORMING SYSTEM

- A. Install in accordance with manufacturer's written installation instructions.

3.9 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.10 CLEANING

- A. Clean piping specialties of dirt and superfluous materials. [**Flush with potable water.**]

3.11 PROTECTION

- A. Protect piping specialties during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day and when work stops.

END OF SECTION 22 05 76 00



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Task	Specification	Specification Description
22 05 76 00	22 05 00 00a	Testing, Adjusting, and Balancing for Plumbing



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SECTION 22 07 16 00 - PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Calcium silicate equipment insulation.
2. Cellular glass equipment insulation.
3. Flexible elastomeric equipment insulation.
4. Glass-fiber equipment insulation.
5. Mineral wool equipment insulation.
6. Polyolefin equipment insulation.
7. Insulating cements.
8. Insulation adhesives.
9. Insulation mastics and coatings.
10. Insulation sealants.
11. Field-applied insulation jackets.
12. Field-applied fabric-reinforcing mesh for insulation.
13. Field-applied cloths for insulation.
14. Vapor-retarder tapes.
15. Insulation securements.
16. Insulation corner angles.

B. Related Requirements:

1. Section 220719 "Plumbing Piping Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each specified system and assembly, including components and accessories.

1. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Health Product Declaration (HPD): For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
5. Environmental Product Declaration (EPD): For each product.
6. Health Product Declaration (HPD): For each product.
7. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
8. Environmental Product Declaration (EPD): For each product.
9. Environmental Product Declaration (EPD): For each product.
10. Environmental Product Declaration (EPD): For each product.
11. Third-Party Certifications: For each product.
12. Third-Party-Certified Life-Cycle Assessment: For each product.
13. Product Data: For adhesives, mastics, and sealants, indicating VOC content.

14. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail removable insulation at equipment connections.
2. Detail application of field-applied jackets.
3. Detail application at linkages of control devices.
4. Detail field application for each equipment type.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: **12 inches (300 mm)** square.
2. Sheet Jacket Materials: **12 inches (300 mm)** square.
3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field Quality Control Reports: For specified tests and inspections.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program [, **certified by the Department of Labor, Bureau of Apprenticeship and Training**] .

1.5 MOCKUPS

A. Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Equipment Mockups:
 - a. One tank or vessel.
 - b. One pump.
2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect [**seven**]**<Insert number>** days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.

5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include, the name of the manufacturer, fabricator, type, description, and size [, **as well as ASTM standard designation, and maximum use temperature**] .

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with equipment Installer for equipment insulation application. Before preparing equipment Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. All Insulation Installed Indoors; Outdoors-Installed Insulation in Contact with Airstream: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 3. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 EQUIPMENT INSULATION MATERIALS, GENERAL

- A. Comply with requirements in "Domestic Water Boiler Breeching Insulation Schedule" and "Indoor Equipment Insulation Schedule" articles for where insulating materials are to be applied.
- B. Products are not to contain asbestos, lead, mercury, or mercury compounds.



- C. Products that come into contact with stainless steel are to have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel are to be qualified as acceptable in accordance with ASTM C795.
- E. Foam insulation materials are not to use CFC or HCFC blowing agents in the manufacturing process.

2.3 CALCIUM SILICATE EQUIPMENT INSULATION

A. Equipment Insulation - Calcium Silicate:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[TPS Industrial; a trademark of Chase Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[TPS Industrial; a trademark of Chase Manufacturing, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Description: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement.
4. Standard: ASTM C533, Type I or Type II.
5. Prefabricated Fitting Covers: ASTM C450 and ASTM C585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.4 CELLULAR GLASS EQUIPMENT INSULATION

A. Equipment Insulation - Cellular Glass:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Owens Corning]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Owens Corning]**

- b. <Insert manufacturer's name>
- 3. Description: Cellular glass equipment insulation of inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells.
- 4. Standard: ASTM C552.
- 5. Block Insulation: Type I.
- 6. Special-Shaped Insulation: Type III.
- 7. Board Insulation: Type IV.
- 8. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
- 9. Equipment insulation without facing.
- 10. Equipment Insulation With Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
 - c. FSK Facing: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - d. FSP Facing: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type III.
 - e. Vinyl Facing: White vinyl with a permeance of **1.3 perms (0.86 metric perm)** when tested in accordance with ASTM E96/E96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.5 FLEXIBLE ELASTOMERIC EQUIPMENT INSULATION

A. Equipment Insulation - Flexible Elastomeric:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. <Insert manufacturer's name>
- 3. Description: Closed-cell or expanded-rubber flexible elastomeric equipment insulation.
- 4. Standard ASTM C543/ASTMC534M, Type II for sheet materials.
- 5. Suitable for maximum use temperature between **70 deg F (minus 57 deg C)** and **220 deg F (104 deg C)**.

2.6 GLASS-FIBER EQUIPMENT INSULATION**A. Equipment Insulation - Glass-Fiber Blanket:**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: Glass-fiber blanket equipment insulation consisting of glass fibers bonded with a thermosetting resin.
4. Suitable for maximum use temperature up to **450 deg F (232 deg C)** in accordance with ASTM C411.
5. Unfaced, Type I.
6. Factory-Applied Insulation Facing:
 - a. FSK: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - b. Vinyl: White vinyl with a permeance of **1.3 perms (0.86 metric perm)** when tested in accordance with ASTM E96/E96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

B. Equipment Insulation - High-Temperature, Glass-Fiber Blanket:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: High-temperature glass-fiber equipment blanket insulation consisting of glass fibers bonded with a thermosetting resin.
 4. Standard: ASTM C553, Type V.
 5. Unfaced.
 6. Suitable for maximum use temperature up to **1000 deg F (650 deg C)**.

C. Equipment Insulation - Glass-Fiber Board:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: Glass-fiber board equipment insulation consisting of glass fibers bonded with a thermosetting resin.
4. Standard: ASTM C612, Type IA or Type IB.
5. Suitable for maximum use temperature between **35 deg F (1.7 deg C)** and **250 deg F (121 deg C)** for jacketed and between **35 deg F (1.7 deg C)** and **450 deg F (232 deg C)** for unfaced in accordance with ASTM C411.
6. Unfaced.
7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type III.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.

D. Equipment Insulation - High-Temperature, Glass-Fiber Board:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: High-temperature, glass-fiber board insulation consisting of glass fibers bonded with a thermosetting resin.
4. Standard: ASTM C612, Type III, unfaced.
5. Suitable for maximum use temperature up to **1000 deg F (650 deg C)** in accordance with ASTM C411.

E. Equipment Insulation - Glass-Fiber, Pipe and Tank:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: Glass-fiber, pipe and tank insulation consisting of glass fibers bonded with a

- thermosetting resin.
- 4. Standard: ASTM C1393.
- 5. Suitable for maximum use temperature between **35 deg F (1.7 deg C)** and **850 deg F (454 deg C)**, in accordance with ASTM C411.
- 6. Semirigid board material with factory-applied **[ASJ][FSK]** jacket.
- 7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type III.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.

2.7 MINERAL WOOL EQUIPMENT INSULATION

A. Equipment Insulation - Mineral Wool Blanket:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
- 3. Description: Mineral wool equipment insulation blanket consisting of basalt volcanic rock-derived fibers bonded with a thermosetting resin.
- 4. Standard: ASTM C553.
- 5. Unfaced.
- 6. Suitable for maximum use temperature up to **1200 deg F (650 deg C)** in accordance with ASTM C447.

B. Equipment Insulation - Mineral Wool Board:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
3. Description: Mineral wool board equipment insulation consisting of basalt volcanic rock-derived fibers bonded with a thermosetting resin.
 4. Standard: ASTM C612, Type III, unfaced.
 5. Suitable for maximum use temperature up to **1100 deg F (600 deg C)** in accordance with ASTM C411.

C. Equipment Insulation - Mineral Wool, Pipe and Tank:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
3. Description: Mineral wool, pipe and tank insulation consisting of fibers bonded with a thermosetting resin.
4. Standard: ASTM C1393.
5. Suitable for maximum use temperature up to **1000 deg F (538 deg C)**, in accordance with ASTM C411.
6. Semirigid board material.
7. Factory-Applied Insulation Facings:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type III.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.

2.8 POLYOLEFIN EQUIPMENT INSULATION

A. Equipment Insulation - Polyolefin:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Armacell LLC]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Armacell LLC]
 - b. <Insert manufacturer's name>
 3. Description: Polyethylene type of polyolefin thermal plastic equipment insulation.
 4. Standard: ASTM C1427, Type I, Grade I for tubular materials and Type II, Grade I for sheet materials.

2.9 INSULATING CEMENTS

A. Insulating Cement for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Ramco Insulation, Inc.]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ramco Insulation, Inc.]
 - b. <Insert manufacturer's name>
3. Standard: ASTM C195.

B. Insulating Cement for Expanded or Exfoliated Vermiculite:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Ramco Insulation, Inc.]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ramco Insulation, Inc.]
 - b. <Insert manufacturer's name>

3. Standard: ASTM C196.

C. Hydraulic-Setting Insulating and Finishing Cement for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Ramco Insulation, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ramco Insulation, Inc.]**
 - b. **<Insert manufacturer's name>**
3. Standard: ASTM C449.

2.10 INSULATION ADHESIVES

A. Materials are to be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Insulation Adhesive for Lagging Cloth:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Vimasco Corporation]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Vimasco Corporation]**
 - d. **<Insert manufacturer's name>**
3. Standard: MIL-A-3316C, Class I, Grade A.
4. Adhesives to be compatible with insulation materials, jackets, and substrates.
5. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over insulation.
6. Service Temperature Range: **[20 to plus 180 deg F (Minus 6 to plus 82 deg C)][0 to plus 180 deg F (Minus 18 to plus 82 deg C)]** .
7. Color: White.

8. Verify adhesive is as recommended by insulation manufacturer and has a VOC content of **[50]<Insert number> g/L or less.**

C. Insulation Adhesive for Calcium Silicate:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **[Vimasco Corporation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **[Vimasco Corporation]**
 - e. **<Insert manufacturer's name>**
3. Description: Fibrous, sodium-silicate-based adhesive with a service temperature range of **50 to 800 deg F (10 to 427 deg C)**.
4. Adhesive: As recommended by adhesive manufacturer and with a VOC content of 80 g/L or less.

D. Insulation Adhesive for Cellular Glass:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
3. Description: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of **minus 100 to plus 200 deg F (minus 73 to plus 93 deg C)**.
4. Adhesive: As recommended by cellular-glass manufacturer and with a VOC content of 80 g/L or less.

E. Insulation Adhesive, Solvent Based for Flexible Elastomeric and Polyolefin:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. **<Insert manufacturer's name>**
3. Description: Solvent-based adhesive for flexible elastomeric and polyolefin insulation.
4. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
5. Wet Flash Point: Below **0 deg F (minus 18 deg C)**.
6. Service Temperature Range: **40 to 200 deg F (4 to plus 93 deg C)**.
7. Color: **[Black]<Insert color>** .
8. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of **[80]<Insert value>** g/L or less.

F. Insulation Adhesive for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Standard: MIL-A-3316C, Class 2, Grade A.
4. Adhesive: As recommended by mineral-fiber manufacturer and with a VOC content of 80 g/L or less.
5. Verify fiberglass adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).

- G. Insulation Adhesive for ASJ, FSK and PVDC Facings/Jackets: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 3. Description: Adhesive for bonding ASJ, FSK and PVDC facing/jacket lap seams and joints.
 4. Standard: MIL-A-3316C, Class 2, Grade A.
 5. Verify adhesives have a VOC content of 80 g/L or less.
- H. Insulation Adhesive for PVC Jackets:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Sekisui Voltek, LLC]**
 - e. **[Speedline Corporation]**
 - f. **[The Dow Chemical Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Sekisui Voltek, LLC]**
 - e. **[Speedline Corporation]**
 - f. **[The Dow Chemical Company]**
 - g. **<Insert manufacturer's name>**
 3. Description: PVC jacket adhesive to be compatible with and as recommended in PVC jacket manufacturer's literature.

- I. Adhesive: As recommended by PVC jacket manufacturer and with a VOC content of 50 g/L or less.

2.11 INSULATION MASTICS AND COATINGS

- A. Materials are to be compatible with insulation materials, jackets, and substrates.
 1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
 2. Verify mastics comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify mastics comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Verify mastics comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify the building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- B. Insulation Vapor-Retarder Mastic - Water Based, Indoor Use:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
 3. Description: Insulation vapor-retarder mastic, water-based, suitable for indoor use on below-ambient services.
 4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
 6. Standard: MIL-PRF-19565C, Type II, for permeance requirements **[, with supplier listing on DOD QPD - Qualified Products Database]** .
 7. Color: **[White]<Insert color>** .

C. Insulation Vapor-Retarder Mastic - Solvent Based, Indoor Use:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Insulation vapor-retarder mastic, solvent-based, suitable for indoor use on below-ambient services.
4. Water-Vapor Permeance: ASTM E96/E96M or ASTM F1249.
5. Service Temperature Range: **0 to 180 deg F (Minus 18 to plus 82 deg C)**.
6. Color: **[White]<Insert color>** .

D. Insulation Vapor-Retarder Mastic - Solvent Based, Outdoor Use:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Insulation vapor-retarder mastic, solvent-based, suitable for outdoor use on below-ambient services.
4. Water-Vapor Permeance: ASTM E96/E96M or ASTM F1249.
5. Service Temperature Range: **Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C)**.
6. Color: **[White]<Insert color>** .

E. Insulation Breather Mastic - Water Based, Indoor/Outdoor:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
3. Description: Insulation breather mastic, water-based, suitable for indoor and outdoor use on above-ambient surfaces.
4. Water-Vapor Permeance: ASTM E96/E96M, greater than **1.0 perm (0.66 metric perms)** at manufacturer's recommended dry film thickness.
5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
6. Color: **[White]<Insert color>** .

2.12 INSULATION SEALANTS

A. Insulation Joint Sealant:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **[Owens Corning]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **[Owens Corning]**

- e. **<Insert manufacturer's name>**
- 3. Permanently flexible, elastomeric sealant.
- 4. Service Temperature Range: **[Minus 150 to plus 250 deg F (Minus 101 to plus 121 deg C)][Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C)]** .
- 5. Color: White or gray.
- 6. Sealant shall have a VOC content of 420 g/L or less.
- B. Flashing Sealant for FSK and Metal Jackets:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 - 3. Sealant to be compatible with insulation materials, jackets, and substrates.
 - 4. Fire- and water-resistant, flexible, elastomeric sealant.
 - 5. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C)**.
 - 6. Color: Aluminum.
 - 7. Verify sealant has a VOC content of 420 g/L or less.
- C. Flashing Sealants for ASJ, PVDC, and PVC Jackets:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 - 3. Sealant to be compatible with insulation materials, jackets, and substrates.
 - 4. Fire- and water-resistant, flexible, elastomeric sealant.

5. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).**
6. Color: White.
7. Verify sealant has a VOC content of 420 g/L or less.

2.13 FIELD-APPLIED INSULATION JACKETS

- A. Field-applied jackets are to comply with ASTM C1136, Type I, unless otherwise indicated.
- B. Insulation Jacket, Field Applied - FSK:
 1. Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Equipment Insulation Jacket, Field Applied - PVC:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Speedline Corporation]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Speedline Corporation]**
 - e. **<Insert manufacturer's name>**
 3. High-impact-resistant, UV-resistant PVC complying with ASTM 1784, Class 16354-C.
 4. Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" articles.
 5. Jacket: Roll stock ready for shop or field cutting and forming.
 6. Adhesive: As recommended by jacket material manufacturer.
 7. Color: **[White][Color-code jackets based on system. Color as selected by Architect]** .
 8. Factory-fabricated tank heads and tank side panels.
- D. Insulation Jacket, Field Applied - Metal:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Jacket Material: Aluminum.
 - a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
 - b. Standard: **ASTM B209 (ASTM B209M)**, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - c. Finish and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" articles.
 - d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
4. Jacket Material - Stainless Steel Jacket.
 - a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
 - b. Standard: **ASTM A240/A240M**.
 - c. Material Type, Finish, and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" articles.
 - d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
 - f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Insulation Jacket, Field Applied - Outdoor, Self Adhesive (Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Description: Self-adhesive outdoor asphaltic jacket of rubberized bituminous resin on a cross-laminated polyethylene film covered with **[white][stucco-embossed]** aluminum-foil.
4. Vapor Barrier/Waterproofing Membrane: **60-mil- (1.5-mm-)** thick.

F. Insulation Jacket, Field Applied - Indoor/Outdoor, Self Adhesive (Non-Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**
3. Description: Vapor barrier and waterproofing jacket for installation over insulation located aboveground outdoors or indoors.
4. Specialized jacket to have five layers of laminated aluminum and polyester film with low-temperature acrylic pressure-sensitive adhesive.
5. Outer aluminum surface is to be coated with UV-resistant coating for protection from environmental contaminants.
6. Permeance: 0.00 perm as tested in accordance with ASTM F1249.
7. Flamespread/Smoke Developed: 25/50 as tested in accordance with ASTM E84.
8. Aluminum Finish: **[Embossed][Smooth]** .
9. Outer Aluminum Surface: Coated with UV-resistant coating for protection from environmental contaminants.

G. Insulation Jacket, Field Applied - Indoor, PVDC:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
 3. Description: PVDC jacket for indoor applications with white PVDC biaxially oriented barrier film.
 4. Vapor Barrier/Waterproofing Membrane: **4 mil (0.10 mm)** thick.
 5. Permeance: **0.02 perm (0.013 metric perm)** when tested in accordance with ASTM E96/E96M.
 6. Flame-Spread/Smoke-Developed Index: Flame-spread index of 10 and a smoke-developed index of 20 when tested in accordance with ASTM E84.
- H. Insulation Jacket, Field Applied - Outdoor, PVDC:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
 3. Description: PVDC jacket for outdoor applications with white PVDC biaxially oriented barrier film.
 4. Vapor Barrier/Waterproofing Membrane: **6 mil (0.15 mm)** thick.
 5. Permeance: **0.01 perm (0.007 metric perm)** when tested in accordance with ASTM E96/E96M.
 6. Flame-Spread/Smoke-Developed Index: Flame-spread index of 25 and a smoke-developed index of 50 when tested in accordance with ASTM E84.
- I. Insulation Jacket, Field Applied - PVDC-SSL:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
3. Description: PVDC jacket with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
 4. Thickness: **6 mil (0.15 mm)**.
 5. Permeance: **0.01 perm (0.007 metric perm)** when tested in accordance with ASTM E96/E96M.
 6. Flame-Spread/Smoke-Developed Index: Flame-spread index of 25 and a smoke-developed index of 50 when tested in accordance with ASTM E84.

2.14 FIELD-APPLIED FABRIC-REINFORCING MESH FOR INSULATION

A. Woven Glass-Fiber Mesh for Equipment Insulation, Field Applied:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
3. Description: Woven glass-fiber mesh for covering equipment insulation.
4. Weight: Approximately **4 oz./sq. yd. (114 g/sq. m)**.
5. Thread Count: **5 strands by 5 strands/sq. in. (2 strands by 2 strands/sq. mm)**.

B. Woven Polyester Mesh for Equipment Insulation, Field Applied:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Vimasco Corporation]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**

- b. **[Foster Brand; H. B. Fuller]**
- c. **[Vimasco Corporation]**
- d. **<Insert manufacturer's name>**
- 3. Description: Woven polyester mesh for covering pipe and pipe fittings insulation.
- 4. Weight: **1 oz./sq. yd. (34 g/sq. m).**
- 5. Thread Count: **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm).**
- 6. Weave Type: Leno.

2.15 FIELD-APPLIED CLOTHS FOR INSULATION

A. Woven Glass-Fiber Cloth, Field Applied, for Insulation:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**
- 3. Description: Woven glass-fiber cloth.
- 4. Standard: MIL-C-20079H, Type I, plain weave.
- 5. Weave: Plain.
- 6. Weight: Minimum of **8 oz./sq. yd. (271 g/sq. m)**, presized.

2.16 VAPOR-RETARDER TAPES

A. Vapor-Retarder Tape for ASJ:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**

- c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
- d. **[Knauf Insulation]**
- e. **<Insert manufacturer's name>**

- 3. Description: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
- 4. Standard: ASTM C1136.
- 5. Width: **[3 inches (75 mm)]<Insert value>** .
- 6. Thickness: **[11.5 mils (0.29 mm)]<Insert value>** .
- 7. Adhesion: **[90 ounces force/inch (1.0 N/mm)]<Insert value>** in width.
- 8. Elongation: **[2]<Insert number>** percent.
- 9. Tensile Strength: **[40 lbf/inch (7.2 N/mm)]<Insert value>** in width.
- 10. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Vapor-Retarder Tape for FSK:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
- 3. Description: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
- 4. Standard: ASTM C1136.
- 5. Width: **[3 inches (75 mm)]<Insert value>** .
- 6. Thickness: **[6.5 mils (0.16 mm)]<Insert value>** .
- 7. Adhesion: **[90 ounces force/inch (1.0 N/mm)]<Insert value>** in width.
- 8. Elongation: **[2]<Insert number>** percent.
- 9. Tensile Strength: **[40 lbf/inch (7.2 N/mm)]<Insert value>** in width.
- 10. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Vapor-Retarder Tape for PVC:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - c. **<Insert manufacturer's name>**
3. Description: White, vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive.
4. Suitable for indoor and outdoor applications.
5. Width: **[2 inches (50 mm)]<Insert value>** .
6. Thickness: **[6 mils (0.15 mm)]<Insert value>** .
7. Adhesion: **[64 ounces force/inch (0.7 N/mm)]<Insert value>** in width.
8. Elongation: 500 percent.
9. Tensile Strength: **18 lbf/inch (3.3 N/mm)** in width.

D. Vapor-Retarder Tape - Aluminum Foil:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **[Sekisui Voltek, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **[Sekisui Voltek, LLC]**
 - f. **<Insert manufacturer's name>**
3. Description: Aluminum-foil vapor-retarder tape with acrylic adhesive.
4. Width: **[2 inches (50 mm)]<Insert value>** .
5. Thickness: **[3.7 mils (0.093 mm)]<Insert value>** .
6. Adhesion: **[100 ounces force/inch (1.1 N/mm)]<Insert value>** in width.
7. Elongation: **[5]<Insert number>** percent.
8. Tensile Strength: **[34 lbf/inch (6.2 N/mm)]<Insert value>** in width.

E. Vapor-Retarder Tape - PVDC, for Indoor Applications:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**

- b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
- 3. Description: White vapor-retarder PVDC tape with acrylic adhesive, for indoor applications.
- 4. Width: **[3 inches (75 mm)]<Insert value>** .
- 5. Film Thickness: **[6 mils (0.15 mm)]<Insert value>** .
- 6. Adhesive Thickness: **[1.5 mils (0.04 mm)]<Insert value>** .
- 7. Elongation at Break: **[145]<Insert value>** percent.
- 8. Tensile Strength: **[55 psi (138 kPa)]<Insert value>** in width.

F. Vapor-Retarder Tape -PVDC, for Outdoor Applications:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **<Insert manufacturer's name>**
- 3. Description: White vapor-retarder PVDC tape with acrylic adhesive, for outdoor applications.
- 4. Width: **[3 inches (75 mm)]<Insert value>** .
- 5. Film Thickness: **[6 mils (0.15 mm)]<Insert value>** .
- 6. Adhesive Thickness: **[1.5 mils (0.04 mm)]<Insert value>** .
- 7. Elongation at Break: **[145]<Insert number>** percent.
- 8. Tensile Strength: **[55 psi (379 kPa)]<Insert value>** in width.

2.17 INSULATION SECUREMENTS

A. Insulation Bands:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Insulation Bands - Stainless Steel: ASTM A240/A240M, **[Type 304][or][Type 316]** ; **0.015 inch (0.38 mm)** thick, **[1/2 inch (13 mm)][3/4 inch (19 mm)]** wide with **[wing seal][or][closed seal]** .
 4. Insulation Bands - Aluminum: **ASTM B209 (ASTM B209M)**, Alloy 3003, 3005, 3105, or 5005; Temper H-14, **0.020 inch (0.51 mm)** thick, **[1/2 inch (13 mm)][3/4 inch (19 mm)]** wide with **[wing seal][or][closed seal]** .
 5. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Insulation Pins and Hangers - Capacitor-Discharge-Weld Pins:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[AGM Industries, Inc]**
 - 2) **[Gemco]**
 - 3) **[Midwest Fasteners, Inc]**
 - 4) **[Nelson Stud Welding]**
 - 5) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[AGM Industries, Inc]**
 - 2) **[Gemco]**
 - 3) **[Midwest Fasteners, Inc]**
 - 4) **[Nelson Stud Welding]**
 - 5) **<Insert manufacturer's name>**
- c. Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding.
- d. Shank: **[0.106-inch- (2.6-mm-)][0.135-inch- (3.5-mm-)]** diameter.
- e. Length: To suit depth of insulation indicated.

2. Insulation Pins and Hangers - Cupped-Head, Capacitor-Discharge-Weld Pins:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[AGM Industries, Inc]**
 - 2) **[CL WARD & Family Inc.]**
 - 3) **[Gemco]**
 - 4) **[Midwest Fasteners, Inc]**
 - 5) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[AGM Industries, Inc]**
 - 2) **[CL WARD & Family Inc.]**
 - 3) **[Gemco]**
 - 4) **[Midwest Fasteners, Inc]**
 - 5) **<Insert manufacturer's name>**
 - c. Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding.
 - d. Shank: **[0.106-inch- (2.6-mm-)]****[0.135-inch- (3.5-mm-)]** diameter.
 - e. Length: To suit depth of insulation indicated, with integral **1-1/2-inch (38-mm)** galvanized carbon-steel washer.
3. Insulation Pins and Hangers - Metal, Adhesively Attached, Perforated Base:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[AGM Industries, Inc]**
 - 2) **[CL WARD & Family Inc.]**
 - 3) **[Gemco]**
 - 4) **[Midwest Fasteners, Inc]**
 - 5) **[Nelson Stud Welding]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[AGM Industries, Inc]**
 - 2) **[CL WARD & Family Inc.]**
 - 3) **[Gemco]**
 - 4) **[Midwest Fasteners, Inc]**
 - 5) **[Nelson Stud Welding]**
 - 6) **<Insert manufacturer's name>**
 - c. Description: Baseplate welded to projection spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
 - d. Baseplate: Perforated, galvanized carbon-steel sheet, **0.030 inch (0.76 mm)** thick by **2 inches (50 mm)** square.
 - e. Spindle: **[Copper- or zinc-coated, low-carbon steel][Aluminum][Stainless steel]** , fully annealed, **0.106-inch- (2.6-mm-)** diameter shank; length to suit depth of insulation indicated.
 - f. Adhesive: Recommended by hanger manufacturer. Use product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Insulation Hangers - Nonmetal, Adhesively Attached, Perforated Base:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following] :

- 1) [Gemco]
- 2) [Midwest Fasteners, Inc]
- 3) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Gemco]
- 2) [Midwest Fasteners, Inc]
- 3) <Insert manufacturer's name>

- c. Description: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
- d. Baseplate Material: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
- e. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank; length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
- f. Adhesive: Recommended by hanger manufacturer. Use product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Insulation Hangers - Self-Sticking-Base:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- 1) [AGM Industries, Inc]
- 2) [Gemco]
- 3) [Midwest Fasteners, Inc]
- 4) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [AGM Industries, Inc]
- 2) [Gemco]
- 3) [Midwest Fasteners, Inc]
- 4) <Insert manufacturer's name>

- c. Description: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
- d. Baseplate Material: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
- e. Spindle: [Copper- or zinc-coated, low-carbon steel][Aluminum][Stainless steel] , fully annealed; 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
- f. Adhesive-backed base with a peel-off protective cover.

6. Insulation Washers - Insulation Retaining:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[AGM Industries, Inc]**
 - 2) **[Gemco]**
 - 3) **[Midwest Fasteners, Inc]**
 - 4) **[Nelson Stud Welding]**
 - 5) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[AGM Industries, Inc]**
 - 2) **[Gemco]**
 - 3) **[Midwest Fasteners, Inc]**
 - 4) **[Nelson Stud Welding]**
 - 5) **<Insert manufacturer's name>**
- c. Description: Self-locking washers formed from **0.016-inch- (0.41-mm-)** thick, **[galvanized-steel][aluminum][stainless steel]** sheet, with beveled edge sized as required to hold insulation securely in place but not less than **1-1/2 inches (38 mm)** in diameter.
- d. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Insulation Washers - Nonmetal, Insulation Retaining:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - 1) **[Gemco]**
 - 2) **[Midwest Fasteners, Inc]**
 - 3) **<Insert manufacturer's name>**
- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[Gemco]**
 - 2) **[Midwest Fasteners, Inc]**
 - 3) **<Insert manufacturer's name>**
- c. Description: Self-locking washers formed from **0.016-inch- (0.41-mm-)** thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than **1-1/2 inches (38 mm)** in diameter.

C. Insulation Staples: Outward-clinching insulation staples, nominal **3/4-inch- (19-mm-)** wide, stainless steel or Monel.

D. Insulation Wire:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[C & F Wire Products]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[RPR Products, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[C & F Wire Products]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[RPR Products, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: **[0.080-inch (2.0-mm) nickel-copper alloy][0.062-inch (1.6-mm) soft-annealed, stainless steel][0.062-inch (1.6-mm) soft-annealed, galvanized steel]** .

2.18 INSULATION CORNER ANGLES

A. Insulation Corner Angles - PVC:

1. Thickness: Minimum **[30-mils (0.8-mm-)]<Insert dimension>** .
2. Dimensions: Minimum **1- by 1-inch (25- by 25-mm)**.
3. Material: PVC in accordance with ASTM D1784, Class 16354-C, white or color-coded to match adjacent surface.

B. Insulation Corner Angles - Aluminum:

1. Thickness: Minimum **[0.040-inch (1.0-mm-)]<Insert dimension>** .
2. Dimensions: Minimum **1- by 1-inch (25- by 25-mm)**.
3. Material: Aluminum in accordance with **ASTM B209 (ASTM B209M)**, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

C. Insulation Corner Angles - Stainless Steel:

1. Thickness: **[0.024-inch (0.61-mm-)]<Insert dimension>** .
2. Dimensions: Minimum **1- by 1-inch (25- by 25-mm)**.
3. Material: Stainless steel in accordance with ASTM A240/A240M, **[Type 304][or][Type 316]** .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that equipment to be insulated has been tested and is free of defects.

2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer **5 mils (0.127 mm)** thick and an epoxy finish **5 mils (0.127 mm)** thick if operating in a temperature range between **140 and 300 deg F (60 and 149 deg C)**. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between **32 and 300 deg F (0 and 149 deg C)** with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 INSTALLATION OF EQUIPMENT INSULATION, GENERAL

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of equipment, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents [, **unless otherwise approved by the engineer of record**] .

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or area of compression in the insulation.
 2. Cover circumferential joints with **3-inch- (75-mm-)** wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced **4 inches (100 mm)** o.c.
 3. Overlap jacket longitudinal seams at least **1-1/2 inches (38 mm)**. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at **[2 inches (50 mm)][4 inches (100 mm)]** o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.
- L. Cut insulation in a manner to avoid compressing insulation.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **4 inches (100 mm)** beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- O. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.
- P. Insulation Installation on Pumps:
1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on **6-inch (150-mm)** centers, starting at corners. Install **3/8-inch- (10-mm-)** diameter fasteners with wing nuts. Alternatively, secure the box sections together using a field-adjustable latching mechanism.
 2. Fabricate boxes from **[galvanized steel][aluminum][or][stainless steel]** , at least **[0.040 inch (1.0 mm)][0.050 inch (1.3 mm)][0.060 inch (1.6 mm)]** thick.
 3. For below-ambient services, install a vapor barrier at seams, joints, and penetrations. Seal

between flanges with replaceable gasket material to form a vapor barrier.

3.4 INSTALLATION OF MINERAL WOOL EQUIPMENT INSULATION

- A. Secure mineral wool equipment insulation with adhesive and anchor pins and speed washers.
- B. Apply adhesives in accordance with manufacturer's recommended coverage rates per unit area, for [100][50]<Insert number> percent coverage of tank and vessel surfaces.
- C. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
- D. Protect exposed corners with secured corner angles.
- E. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - 1. Do not weld anchor pins to ASME-labeled pressure vessels.
 - 2. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - 3. On tanks and vessels, maximum anchor-pin spacing is to be **3 inches (75 mm)** from insulation end joints and **16 inches (400 mm)** o.c. in both directions.
 - 4. Do not compress insulation during installation.
 - 5. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - 6. Impale insulation over anchor pins, and attach speed washers.
 - 7. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- F. Secure each layer of insulation with stainless steel or aluminum bands. Select band material compatible with insulation materials.
- G. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately **6 inches (150 mm)** from each end. Install wire or cable between two circumferential girdles **12 inches (300 mm)** o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of **48 inches (1200 mm)** o.c. Use this network for securing insulation with tie wire or bands.
- H. Stagger joints between insulation layers at least **3 inches (75 mm)**.
- I. Install insulation in removable and replaceable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
- J. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- K. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.5 INSTALLATION OF GLASS-FIBER EQUIPMENT INSULATION

- A. Secure glass-fiber equipment insulation with adhesive and anchor pins and speed washers.
- B. Apply adhesives in accordance with manufacturer's recommended coverage rates per unit area, for **[100][50]<Insert number>** percent coverage of tank and vessel surfaces.
- C. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
- D. Protect exposed corners with secured corner angles.
- E. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - 1. Do not weld anchor pins to ASME-labeled pressure vessels.
 - 2. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - 3. On tanks and vessels, maximum anchor-pin spacing is to be **3 inches (75 mm)** from insulation end joints and **16 inches (400 mm)** o.c. in both directions.
 - 4. Do not compress insulation during installation.
 - 5. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - 6. Impale insulation over anchor pins, and attach speed washers.
 - 7. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 8. Secure each layer of insulation with stainless steel or aluminum bands. Select band material compatible with insulation materials.
 - 9. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately **6 inches (150 mm)** from each end. Install wire or cable between two circumferential girdles **12 inches (300 mm)** o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of **48 inches (1200 mm)** o.c. Use this network for securing insulation with tie wire or bands.
 - 10. Stagger joints between insulation layers at least **3 inches (75 mm)**.
 - 11. Install insulation in removable and replaceable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
 - 12. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
 - 13. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.6 INSTALLATION OF CALCIUM SILICATE EQUIPMENT INSULATION

- A. On Domestic Water Boiler Breechings:
 - 1. Secure single-layer insulation with stainless steel bands at **12-inch (300-mm)** intervals, and tighten bands without deforming insulation material.
 - 2. Install two-layer insulation with joints tightly butted and staggered at least **3 inches (75 mm)**. Secure inner layer with wire spaced at **12-inch (300-mm)** intervals. Secure outer layer with stainless steel bands at **12-inch (300-mm)** intervals.
 - 3. On exposed applications without metal jacket, finish insulation surface with a skim coat of mineral-fiber, hydraulic-setting cement. When cement is dry, apply flood coat of lagging adhesive

and press on one layer of glass cloth. Overlap edges at least **1 inch (25 mm)**. Apply finish coat of lagging adhesive over glass cloth. Thin finish coat to achieve smooth, uniform finish.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC EQUIPMENT INSULATION

- A. Install in accordance with manufacturer's written installation instructions and ASTM C1710.
- B. Apply [**100**]**<Insert value>** percent coverage of adhesive to surface with manufacturer's recommended adhesive.
- C. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Finish: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.8 INSTALLATION OF WOVEN GLASS-FIBER CLOTH

- A. Where woven glass-fiber jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 - 1. Draw jacket smooth and tight to surface with **2-inch (50-mm)** overlap at seams and joints.
 - 2. Embed glass cloth between two **0.062-inch- (1.6-mm-)** thick coats of lagging adhesive.
 - 3. Completely encapsulate insulation with coating, leaving no exposed insulation.

3.9 INSTALLATION OF FIELD-APPLIED INSULATION JACKETS

- A. Insulation Jacket, Field-Applied - FSK:
 - 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with **1-1/2-inch (38-mm)** laps at longitudinal seams and **3-inch- (75-mm-)** wide joint strips at end joints.
 - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Insulation Jacket, Field-Applied - PVC:
 - 1. Install with **1-inch (25-mm)** overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 - 2. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Insulation Jacket, Field-Applied - Metal:
 - 1. Where metal jackets are indicated, install with **2-inch (50-mm)** overlap at longitudinal seams and end joints.
 - 2. Overlap longitudinal seams arranged to shed water.
 - 3. Seal end joints with weatherproof sealant recommended by insulation manufacturer.

4. Secure jacket with stainless steel bands **12 inches (300 mm)** o.c. and at end joints.

D. Insulation Jacket, Field-Applied - PVDC:

1. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of **33-1/2 inches (850 mm)** or less. A **33-1/2-inch- (850-mm-)** circumference limit allows for **2-inch- (50-mm-)** overlap seal.
2. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
3. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

E. Insulation Jacket, Field-Applied - PVDC-SSL:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap presized jackets around individual pipe insulation sections, with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of **2 inches (50 mm)** over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of **33-1/2 inches (850 mm)** or less. The **33-1/2-inch- (850-mm-)** circumference limit allows for **2-inch- (50-mm-)** overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.10 FINISHES

- A. Equipment Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: **[Two]<Insert number>** finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

- a. Finish Coat Material: Interior, flat, latex-emulsion size.

- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

- C. Do not field paint aluminum or stainless steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.

- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]** .
- D. Tests and Inspections: Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to **[one]<Insert number>** location(s) for each type of equipment defined in the "Indoor Plumbing Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
- E. All insulation applications will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.12 DOMESTIC WATER BOILER BREECHING INSULATION SCHEDULE

- A. Round, exposed breeching and connector insulation is to be one of the following:
 - 1. Equipment Insulation - Calcium Silicate: **4 inches (100 mm)** thick.
 - 2. Equipment Insulation - High-Temperature Glass-Fiber Blanket: **3 inches (75 mm)** thick and **3 lb/cu. ft. (48-kg/cu. m)** nominal density.
 - 3. Equipment Insulation - Mineral Wool Blanket: **3 inches (75 mm)** thick and **4 lb/cu. ft. (64 kg/cu. m)** nominal density.
- B. Round, concealed breeching and connector insulation is to be one of the following:
 - 1. Equipment Insulation - Calcium Silicate: **4 inches (100 mm)** thick.
 - 2. Equipment Insulation - High-Temperature Glass-Fiber Blanket: **3 inches (75 mm)** thick and **3 lb/cu. ft. (48 kg/cu. m)** nominal density.
 - 3. Equipment Insulation - Mineral Wool Blanket: **3 inches (75 mm)** thick and **4 lb/cu. ft. (64 kg/cu m)** nominal density.
- C. Rectangular, exposed breeching and connector insulation is to be one of the following:
 - 1. Equipment Insulation - Calcium Silicate: **4 inches (100 mm)** thick.
 - 2. Equipment Insulation - High-Temperature Glass-Fiber Blanket: **3 inches (75 mm)** thick and **3 lb/cu. ft. (48 kg/cu. m)** nominal density.
 - 3. Equipment Insulation - High-Temperature Glass-Fiber Board: **3 inches (75 mm)** thick and **[3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]** nominal density.
 - 4. Equipment Insulation - Mineral Wool Blanket: **3 inches (75 mm)** thick and **4 lb/cu. ft. (64 kg/cu. m)** nominal density.
 - 5. Equipment Insulation - Mineral Wool Board: **3 inches (75 mm)** thick and **[4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]** nominal density.
- D. Rectangular, concealed breeching and connector insulation is to be one of the following:
 - 1. Equipment Insulation - Calcium Silicate: **4 inches (100 mm)** thick.
 - 2. Equipment Insulation - High-Temperature Glass-Fiber Blanket: **3 inches (75 mm)** thick and **3 lb/cu. ft. (48 kg/cu. m)** nominal density.
 - 3. Equipment Insulation - High-Temperature Glass-Fiber Board: **3 inches (75 mm)** thick and **[3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]** nominal density.
 - 4. Equipment Insulation - Mineral Wool Blanket: **3 inches (75 mm)** thick and **[4 lb/cu. ft. (64 kg/cu. m)]<Insert density>** nominal density.

5. Equipment Insulation - Mineral Wool Board: **3 inches (75 mm)** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.

3.13 INDOOR PLUMBING EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Insulate indoor and outdoor equipment that is not factory insulated.
- C. Heat-exchanger (water-to-water for domestic water-heating service) insulation is to be one of the following:
 1. Equipment Insulation - Calcium Silicate: **[3 inches (75 mm)]<Insert dimension>** thick.
 2. Equipment Insulation - Cellular Glass: **[3 inches (75 mm)]<Insert dimension>** thick.
 3. Equipment Insulation - Glass-Fiber Blanket: **[2 inches (50 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 4. Equipment Insulation - Glass-Fiber Board: **[2 inches (50 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 5. Equipment Insulation - Glass-Fiber, Pipe and Tank: **[2 inches (50 mm)]<Insert dimension>** thick.
 6. Equipment Insulation - Mineral Wool Blanket: **[2 inch (50 mm)]<Insert dimension>** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**]**<Insert density>** nominal density.
 7. Equipment Insulation - Mineral Wool Board: **[2 inch (50 mm)]<Insert dimension>** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**]**<Insert density>** nominal density.
 8. Equipment Insulation - Mineral Wool, Pipe and Tank: **[2 inch (50 mm)]<Insert dimension>** thick.
- D. Steam-to-hot-water converter insulation is to be one of the following:
 1. Equipment Insulation - Calcium Silicate: **[3 inches (75 mm)]<Insert dimension>** thick.
 2. Equipment Insulation - Cellular Glass: **[3 inches (75 mm)]<Insert dimension>** thick.
 3. Equipment Insulation - Glass-Fiber Blanket: **[2 inches (50 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 4. Equipment Insulation - Glass-Fiber Board: **[2 inches (50 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 5. Equipment Insulation - Glass-Fiber, Pipe and Tank: **[2 inches (50 mm)]<Insert dimension>** thick.
 6. Equipment Insulation - Mineral Wool Blanket: **[2 inch (50 mm)]<Insert dimension>** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**][**8 lb/cu. ft. (128 kg/cu. m)**]**<Insert density>** nominal density.
 7. Equipment Insulation - Mineral Wool Board: **[2 inch (50 mm)]<Insert dimension>** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**][**8 lb/cu. ft. (128 kg/cu. m)**]**<Insert density>** nominal density.
 8. Equipment Insulation - Mineral Wool, Pipe and Tank: **[2 inch (38 mm)]<Insert dimension>** thick.
- E. Domestic water pump insulation is to be one of the following:
 1. Equipment Insulation - Cellular Glass: **[2 inches (50 mm)]<Insert dimension>** thick.
 2. Equipment Insulation - Glass-Fiber Blanket: **[1 inch (25 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 3. Equipment Insulation - Glass-Fiber Board: **[1 inch (25 mm)]<Insert dimension>** thick and [**2 lb/cu. ft. (32 kg/cu. m)**][**3 lb/cu. ft. (48 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 4. Equipment Insulation - Mineral Wool Blanket: **[1 inch (25 mm)]<Insert dimension>** thick and [**4 lb/cu. ft. (64 kg/cu. m)**][**6 lb/cu. ft. (96 kg/cu. m)**] nominal density.
 5. Equipment Insulation - Mineral Wool Board: **[1 inch (25 mm)]<Insert dimension>** thick and [**4**

lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.

F. Domestic chilled-water (potable) pump insulation is to be one of the following:

1. Equipment Insulation - Cellular Glass: [3 inches (75 mm)]<Insert dimension> thick.
2. Equipment Insulation - Glass-Fiber Blanket: [2 inches (50 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
3. Equipment Insulation - Glass-Fiber Board: [2 inches (50 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
4. Equipment Insulation - Mineral Wool Blanket: [2 inch (50 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.
5. Equipment Insulation - Mineral Wool Board: [2 inch (50 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.

G. Domestic hot-water pump insulation is to be one of the following:

1. Equipment Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
2. Equipment Insulation - Glass-Fiber Blanket: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
3. Equipment Insulation - Glass-Fiber Board: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
4. Equipment Insulation - Mineral Wool Blanket: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
5. Equipment Insulation - Mineral Wool Board: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.

H. Domestic water, domestic chilled-water (potable), and domestic hot-water hydropneumatic tank insulation are to be one of the following:

1. Equipment Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
2. Equipment Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
3. Equipment Insulation - Glass-Fiber Blanket: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
4. Equipment Insulation - Glass-Fiber Board: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
5. Equipment Insulation - Glass-Fiber, Pipe and Tank: [1 inch (25 mm)]<Insert dimension> thick.
6. Equipment Insulation - Mineral Wool Blanket: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.
7. Equipment Insulation - Mineral Wool Board: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.
8. Equipment Insulation - Mineral Wool, Pipe and Tank: [1.5 inch (38 mm)]<Insert dimension> thick.
9. Equipment Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

I. Domestic hot-water storage tank insulation is to be one of the following, of R-value indicated:

1. R-value: [12.5]<Insert value> .
2. Equipment Insulation - Cellular glass.
3. Equipment Insulation - Glass-Fiber Blanket: [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
4. Equipment Insulation - Glass-Fiber Board: [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6

- lb/cu. ft. (96 kg/cu. m)] nominal density.
 5. Equipment Insulation - Glass-fiber pipe and tank.
 6. Equipment Insulation - Mineral Wool Blanket: [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.
 7. Equipment Insulation - Mineral Wool Board: [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)][8 lb/cu. ft. (128 kg/cu. m)]<Insert density> nominal density.
 8. Equipment Insulation - Mineral Wool, Pipe and Tank.
- J. Domestic water storage tank insulation is to be one of the following:
1. Equipment Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
 2. Equipment Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
 3. Equipment Insulation - Glass-Fiber Blanket: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 4. Equipment Insulation - Glass-Fiber Board: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 5. Equipment Insulation - Glass-Fiber, Pipe and Tank: [1 inch (25 mm)]<Insert dimension> thick.
 6. Equipment Insulation - Mineral Wool Blanket: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 7. Equipment Insulation - Mineral Wool Board: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 8. Equipment Insulation - Mineral Wool, Pipe and Tank: [1.5 inch (38 mm)]<Insert dimension> thick.
 9. Equipment Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.
- K. Domestic chilled-water (potable) storage tank insulation is to be one of the following:
1. Equipment Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
 2. Equipment Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
 3. Equipment Insulation - Glass-Fiber Blanket: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 4. Equipment Insulation - Glass-Fiber Board: [1 inch (25 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 5. Equipment Insulation - Glass-Fiber, Pipe and Tank: [1 inch (25 mm)]<Insert dimension> thick.
 6. Equipment Insulation - Mineral Wool Blanket: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 7. Equipment Insulation - Mineral Wool Board: [1 inch (25 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 8. Equipment Insulation - Mineral Wool, Pipe and Tank: [1.5 inch (38 mm)]<Insert dimension> thick.
 9. Equipment Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.
- L. Domestic water filter-housing insulation is to be one of the following:
1. Equipment Insulation - Cellular Glass: [3 inches (75 mm)]<Insert dimension> thick.
 2. Equipment Insulation - Glass-Fiber Blanket: [2 inches (50 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 3. Equipment Insulation - Glass-Fiber Board: [2 inches (50 mm)]<Insert dimension> thick and [2 lb/cu. ft. (32 kg/cu. m)][3 lb/cu. ft. (48 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)] nominal density.
 4. Equipment Insulation - Glass-Fiber, Pipe and Tank: [2 inches (50 mm)]<Insert dimension> thick.
 5. Equipment Insulation - Mineral Wool Blanket: [2 inch (50 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 6. Equipment Insulation - Mineral Wool Board: [2 inch (50 mm)]<Insert dimension> thick and [4 lb/cu. ft. (64 kg/cu. m)][6 lb/cu. ft. (96 kg/cu. m)]<Insert density> nominal density.
 7. Equipment Insulation - Mineral Wool, Pipe and Tank: [2 inch (50 mm)]<Insert dimension> thick.

3.14 INDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Equipment, Concealed from View:
 - 1. None.
 - 2. PVC: **[Standard][Color-coded by system]** .
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)]** .
 - 3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 - 4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 - 5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .
- D. Equipment, Exposed to View, up to 48 Inches (1200 mm) in Diameter or with Flat Surfaces of up to 72 Inches (1800 mm):
 - 1. None.
 - 2. PVC: **[Standard][Color-coded by system]** .
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)]** .
 - 3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 - 4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 - 5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

- E. Equipment, Exposed to View, Larger Than 48 Inches (1200 mm) in Diameter or with Flat Surfaces Larger Than 72 Inches (1800 mm):
1. None.
 2. Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 3. Painted Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 4. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth][stucco embossed]** , with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

3.15 OUTDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Equipment, Concealed from View:
1. None.
 2. PVC: **[Standard][Color-coded by system]** :
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)]** .
 3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
 5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** thick.
- D. Equipment, Exposed to View, up to 48 Inches (1200 mm) in Diameter or with Flat Surfaces of up to 72 Inches (1800 mm):

1. None.
 2. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 3. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed][with Z-shaped locking seam]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 4. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed][with Z-shaped locking seam]** .
 - a. Thickness: **[0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .
- E. Equipment, Exposed to View, Larger Than 48 Inches (1200 mm) in Diameter or with Flat Surfaces Larger Than 72 Inches (1800 mm):
1. None.
 2. Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 3. Painted Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
 4. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth][stucco embossed]** , with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

END OF SECTION 22 07 16 00

SECTION 22 07 19 00 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cellular glass pipe insulation.
2. Flexible elastomeric pipe insulation.
3. Glass-fiber pipe insulation.
4. Mineral wool pipe insulation.
5. Phenolic pipe insulation.
6. Polyolefin pipe insulation.
7. Insulating cements.
8. Insulation adhesives.
9. Insulation mastics and coatings.
10. Insulation sealants.
11. Field-applied insulation jackets.
12. Field-applied fabric-reinforcing mesh.
13. Field-applied cloths for insulation.
14. Vapor-retarder tapes.
15. Insulation securements.
16. Protective shielding guards.

B. Related Requirements:

1. Section 220716 "Plumbing Equipment Insulation" for equipment insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each specified system and assembly, including components and accessories.

1. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Health Product Declaration (HPD): For each product.
4. Environmental Product Declaration (EPD): For each product.
5. Health Product Declaration (HPD): For each product.
6. Environmental Product Declaration (EPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Environmental Product Declaration (EPD): For each product.
9. Third-Party Certifications: For each product.
10. Third-Party-Certified Life-Cycle Assessment: For each product.
11. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
12. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
3. Detail attachment and covering of heat tracing inside insulation.
4. Detail insulation application at pipe expansion joints for each type of insulation.
5. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
6. Detail removable insulation at piping specialties, equipment connections, and access panels.
7. Detail application of field-applied jackets.
8. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: **12 inches (300 mm)** long by **NPS 2 (DN 50)**.
2. Jacket Materials for Pipe: **12 inches (300 mm)** long by **NPS 2 (DN 50)**.
3. Sheet Jacket Materials: **12 inches (300 mm)** square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program [, **certified by the Department of Labor, Bureau of Apprenticeship and Training**] .

1.5 MOCKUPS

- A. Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:
 - a. One **10-foot (3-m)** section of **NPS 2 (DN 50)** straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One **NPS 2 (DN 50)** or smaller valve and one **NPS 2-1/2 (DN 65)** or larger valve.

- e. Four support hangers, including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 - j. One union.
 - 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 - 3. Notify Architect [**seven**]**<Insert number>** days in advance of dates and times when mockups will be constructed.
 - 4. Obtain Architect's approval of mockups before starting insulation application.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
- 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size [, **as well as ASTM standard designation and maximum use temperature**] .

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems [**and after installing and testing heat tracing**] . Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical

products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. All Insulation Installed Indoors; Outdoors-Installed Insulation in Contact with Airstream: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
3. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 PIPING INSULATION MATERIALS, GENERAL

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products are not to contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come into contact with stainless steel are to have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel are to be qualified as acceptable in accordance with ASTM C795.
- E. Foam insulation materials are not to use CFC or HCFC blowing agents in the manufacturing process.

2.3 CELLULAR GLASS PIPE INSULATION

- A. Pipe Insulation - Cellular Glass, Preformed:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Owens Corning]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Owens Corning]**
 - b. **<Insert manufacturer's name>**
 3. Description: Preformed pipe insulation of inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells.
 4. Standard: ASTM C552.
 5. Fabricated shapes in accordance with ASTM C450, ASTM C585, and ASTM C1639.
 6. Without Insulation Facing: Type II, Class 1.
 7. Factory-Applied Insulation Facing: Type II, Class 2.

- a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
- b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
- c. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
- d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.4 FLEXIBLE ELASTOMERIC PIPE INSULATION

A. Pipe Insulation - Flexible Elastomeric:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[K-Flex USA]**
 - d. **<Insert manufacturer's name>**
3. Description: Closed-cell or expanded-rubber flexible elastomeric pipe insulation.
4. Standard: ASTM C534/C534M, Type I, for tubular materials; Type II for sheet materials.
5. Suitable for maximum use temperature between **minus 70 deg F (minus 57 deg C)** and **220 deg F (104 deg C)**.

2.5 GLASS-FIBER PIPE INSULATION

A. Pipe Insulation - Glass-Fiber, Preformed:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Knauf Insulation]**
 - c. **[Manson Insulation Inc.]**
 - d. **[Owens Corning]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Knauf Insulation]**
 - c. **[Manson Insulation Inc.]**
 - d. **[Owens Corning]**
 - e. **<Insert manufacturer's name>**
3. Description: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to **850 deg F (454 deg C)** in accordance with ASTM C411. Comply with ASTM C547.
 4. Preformed Pipe Insulation: Type I, Grade A.
 5. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 6. Unfaced.
 7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
 - c. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

B. Pipe Insulation - Glass-Fiber, Pipe and Tank:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[CertainTeed; SAINT-GOBAIN]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[Knauf Insulation]**
 - d. **[Manson Insulation Inc.]**
 - e. **[Owens Corning]**
 - f. **<Insert manufacturer's name>**
3. Description: Glass fibers bonded with a thermosetting resin.
4. Standard: ASTM C1393.
5. Suitable for maximum use temperature between **35 and 850 deg F (1.7 and 454 deg C)**, in

- accordance with ASTM C411.
- 6. Semirigid board material.
- 7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - c. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.6 MINERAL WOOL PIPE INSULATION

A. Pipe Insulation - Mineral Wool, Preformed:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
3. Description: Mandrel-wound mineral wool fibers bonded with a thermosetting resin, unfaced; suitable for maximum use temperature up to **1200 deg F (650 deg C)** in accordance with ASTM C447. Comply with ASTM C547.
4. Standard: ASTM C547.
5. Preformed Pipe Insulation: Type II, Grade A.
6. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
7. Unfaced.
8. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
 - c. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

B. Pipe Insulation - Mineral Wool, Pipe and Tank:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Owens Corning]**
 - c. **[ROCKWOOL]**
 - d. **<Insert manufacturer's name>**
3. Description: Mineral wool fibers bonded with a thermosetting resin.
4. Standard: ASTM C1393.
5. Suitable for maximum use temperature up to **1000 deg F (538 deg C)**, in accordance with ASTM C411.
6. Semirigid board material.
7. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type III.
 - c. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - d. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.7 PHENOLIC PIPE INSULATION

A. Pipe Insulation - Phenolic:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Kingspan Tarec Industrial Insulation NV]**
 - c. **[Polyguard Products, Inc.]**
 - d. **[Resolco Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[Kingspan Tarec Industrial Insulation NV]**
 - c. **[Polyguard Products, Inc.]**
 - d. **[Resolco Inc.]**
 - e. **<Insert manufacturer's name>**
3. Description: Prefabricated pipe insulation of rigid, expanded, closed-cell structure.
 4. Standard: ASTM C1126.
 5. Prefabricated Pipe Insulation: Type III.
 6. Prefabricated shapes in accordance with ASTM C450 and ASTM C585.
 7. Unfaced.
 8. Factory-Applied Insulation Facing:
 - a. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - b. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
 - c. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.8 POLYOLEFIN PIPE INSULATION

A. Pipe Insulation - Polyolefin:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Armacell LLC]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Armacell LLC]**
 - b. **<Insert manufacturer's name>**
3. Description: Polyethylene thermal plastic insulation.
4. Standard: ASTM C1427, Type I, Grade 1, for tubular materials and with Type II, Grade 1, for sheet materials [, **self-seal**] .

2.9 INSULATING CEMENTS

A. Insulating Cement for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following] :

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 3. Standard: ASTM C195.

B. Insulating Cement for Expanded or Exfoliated Vermiculite:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 3. Standard: ASTM C196.

C. Hydraulic-Setting Insulating and Finishing Cement for Glass Fiber and Mineral Wool:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Ramco Insulation, Inc.]
- b. <Insert manufacturer's name>

- 3. Standard: ASTM C449.

2.10 INSULATION ADHESIVES

- A. Materials are to be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Insulation Adhesive for Lagging Cloth:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Vimasco Corporation]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Vimasco Corporation]**
 - d. **<Insert manufacturer's name>**
 3. Standard: MIL-A-3316C, Class I, Grade A.
 4. Adhesives to be compatible with insulation materials, jackets, and substrates.
 5. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 6. Service Temperature Range: **[20 to plus 180 deg F (Minus 6 to plus 82 deg C)][0 to plus 180 deg F (Minus 18 to plus 82 deg C)]** .
 7. Color: White.
 8. Verify adhesive is as recommended by insulation manufacturer and has a VOC content of **[50]<Insert number>** g/L or less.
- C. Insulation Adhesive for Cellular Glass:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 3. Description: Two-component, thermosetting urethane adhesive containing no flammable solvents,

4. with a service temperature range of **minus 100 to plus 200 deg F (minus 73 to plus 93 deg C)**.
Adhesive: As recommended by cellular-glass manufacturer and with a VOC content of 80 g/L or less.

D. Insulation Adhesive, Solvent Based for Flexible Elastomeric and Polyolefin:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[Foster Brand; H. B. Fuller]**
 - d. **[K-Flex USA]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aeroflex USA]**
 - b. **[Armacell LLC]**
 - c. **[Foster Brand; H. B. Fuller]**
 - d. **[K-Flex USA]**
 - e. **<Insert manufacturer's name>**
3. Description: Solvent-based adhesive for flexible elastomeric and polyolefin insulation.
4. Flame-spread index is to be 25 or less and smoke-developed index is to be 50 or less as tested in accordance with ASTM E84.
5. Wet Flash Point: Below **0 deg F (minus 18 deg C)**.
6. Service Temperature Range: **40 to 200 deg F (4 to plus 93 deg C)**.
7. Color: **[Black]<Insert color>** .
8. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of **[80]<Insert value>** g/L or less.

E. Insulation Adhesive for Glass Fiber and Mineral Wool:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**

- d. **<Insert manufacturer's name>**
 3. Standard: MIL-A-3316C, Class 2, Grade A.
 4. Adhesive: As recommended by mineral-fiber manufacturer and with a VOC content of 80 g/L or less.
 5. Verify fiberglass adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).
- F. Insulation Adhesive for Phenolic:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **<Insert manufacturer's name>**
 3. Description: Solvent-based resin adhesive, with a service temperature range of **minus 75 to plus 300 deg F (minus 59 to plus 149 deg C)**.
 4. Adhesive: As recommended by phenolic manufacturer and with a VOC content of 50 g/L or less.
- G. Insulation Adhesive for ASJ and FSK Facings/Jackets:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
 3. Description: Pipe insulation adhesive for bonding ASJ and FSK facing/jacket insulation lap seams and joints.
 4. Standard: MIL-A-3316C, Class 2, Grade A.
 5. Verify adhesives have a VOC content of 80 g/L or less.

H. Insulation Adhesive for PVC Jackets:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Sekisui Voltek, LLC]**
 - e. **[Speedline Corporation]**
 - f. **[The Dow Chemical Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[P.I.C. Plastics, Inc.]**
 - c. **[Proto Corporation]**
 - d. **[Sekisui Voltek, LLC]**
 - e. **[Speedline Corporation]**
 - f. **[The Dow Chemical Company]**
 - g. **<Insert manufacturer's name>**
3. Description: PVC jacket adhesive to be compatible with and as recommended in PVC jacket manufacturer's literature.
4. Adhesive: As recommended by PVC jacket manufacturer and with a VOC content of 50 g/L or less.

2.11 INSULATION MASTICS AND COATINGS**A. Materials are to be compatible with insulation materials, jackets, and substrates.**

1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.

B. Insulation Vapor-Retarder Mastic - Water Based, Indoor Use:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
3. Description: Insulation vapor-retarder mastic, water-based, suitable for indoor use on below-ambient services.
 4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
 6. Standard: MIL-PRF-19565C, Type II, for permeance requirements **[, with supplier listing on DOD QPD - Qualified Products Database]** .
 7. Color: **[White]<Insert color>** .

C. Insulation Vapor-Retarder Mastic - Solvent Based, Indoor Use:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Insulation vapor-retarder mastic, solvent-based, suitable for indoor use on below-ambient services.
4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
5. Service Temperature Range: **0 to 180 deg F (Minus 18 to plus 82 deg C)**.
6. Color: **[White]<Insert color>** .

D. Insulation Vapor-Retarder Mastic - Solvent Based, Outdoor Use:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Mon-Eco Industries, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Insulation vapor-retarder mastic, solvent-based, suitable for outdoor use on below-ambient services.
4. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
5. Service Temperature Range: **Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).**
6. Color: **[White]<Insert color>** .

E. Insulation Breather Mastic - Water Based, Indoor/Outdoor:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Knauf Insulation]**
 - d. **[Mon-Eco Industries, Inc.]**
 - e. **[Vimasco Corporation]**
 - f. **<Insert manufacturer's name>**
3. Description: Insulation breather mastic, water-based, suitable for indoor and outdoor use on above-ambient surfaces.
4. Water-Vapor Permeance: ASTM E96/E96M, greater than **1.0 perm (0.66 metric perm)** at manufacturer's recommended dry film thickness.
5. Service Temperature Range: **[0 to plus 180 deg F (Minus 18 to plus 82 deg C)][Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)]** .
6. Color: **[White]<Insert color>** .

2.12 INSULATION SEALANTS

A. Insulation Joint Sealant:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. [Owens Corning]
 - e. <Insert manufacturer's name>
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: [Minus 58 to plus 176 deg F (Minus 50 to plus 80 deg C)][Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C)] .
5. Color: White or gray.
6. Sealant shall have a VOC content of 420 g/L or less.

B. Flashing Sealant for FSK and Metal Jackets:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. [Mon-Eco Industries, Inc.]
 - d. <Insert manufacturer's name>
3. Flashing sealant to be compatible with insulation materials, jackets, and substrates.
4. Fire- and water-resistant, flexible, elastomeric sealant.
5. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
6. Color: Aluminum.
7. Verify sealant has a VOC content of 420 g/L or less.

C. Flashing Sealant for ASJ and PVC Jackets:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following] :

- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Childers Brand; H. B. Fuller Construction Products]
 - b. [Foster Brand; H. B. Fuller]
 - c. <Insert manufacturer's name>
3. Flashing sealant to be compatible with insulation materials, jackets, and substrates.
 4. Fire- and water-resistant, flexible, elastomeric sealant.
 5. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).**
 6. Color: White.
 7. Verify sealant has a VOC content of 420 g/L or less.

2.13 FIELD-APPLIED INSULATION JACKETS

- A. Field-applied jackets are to comply with ASTM C1136, Type I, unless otherwise indicated.
- B. Insulation Jacket, Field Applied - FSK:
 1. Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Pipe Insulation Jacket, Field Applied - PVC:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following] :
 - a. [Airex Manufacturing Inc.]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [P.I.C. Plastics, Inc.]
 - d. [Proto Corporation]
 - e. [Speedline Corporation]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Airex Manufacturing Inc.]
 - b. [Johns Manville; a Berkshire Hathaway company]
 - c. [P.I.C. Plastics, Inc.]
 - d. [Proto Corporation]
 - e. [Speedline Corporation]
 - f. <Insert manufacturer's name>

3. Description: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C.
4. Thickness: As indicated in "Outdoor, Field-Applied Jacket Schedule" Articles under Part 3.
5. Jacket: Roll stock ready for shop or field cutting and forming.
6. Adhesive: As recommended by jacket material manufacturer.
7. Color: **[White][Color-code jackets based on system. Color as selected by Architect]** .
8. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Insulation Jacket, Field Applied - Metal:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Jacket Material - Aluminum:
 - a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
 - b. Standard: ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - c. Finish and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" articles under Part 3.
 - d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick polysurlyn]** .
 - e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick polysurlyn]** .
 - f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
4. Jacket Material - Stainless Steel:

- a. Description: **[Sheet and roll stock ready for shop or field sizing][Factory cut and rolled to size]** .
- b. Standard: ASTM A240/A240M.
- c. Material Type, Finish, and Thickness: As indicated in "Indoor, Field-Applied Insulation Jacket Schedule" and "Outdoor, Field-Applied Insulation Jacket Schedule" articles under Part 3.
- d. Moisture Barrier for Indoor Applications: **[1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][3-mil- (0.075-mm-) thick polysurlyn]** .
- e. Moisture Barrier for Outdoor Applications: **[3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper][2.5-mil- (0.063-mm-) thick polysurlyn]** .
- f. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Underground Direct-Buried Jacket:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Owens Corning]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Owens Corning]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Description: Underground direct-buried jacket of rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
4. Vapor Barrier and Waterproofing Membrane: **125 mils (3.2 mm)** thick.

F. Insulation Jacket, Field Applied - Outdoor, Self Adhesive (Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[MFM Building Products Corp.]**
 - b. **[Polyguard Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Description: Self-adhesive outdoor asphaltic jacket of rubberized bituminous resin on a cross-laminated polyethylene film covered with **[white][stucco-embossed]** aluminum-foil.
4. Vapor Barrier/Waterproofing Membrane: **60 mils (1.5 mm)** thick.

G. Insulation Jacket, Field Applied - Indoor/Outdoor, Self Adhesive (Non-Asphaltic):

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M]**
 - b. **[Foster Brand; H. B. Fuller]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **<Insert manufacturer's name>**
3. Description: Vapor barrier and waterproofing jacket for installation over insulation located aboveground outdoors or indoors.
4. Specialized jacket consisting of five layers of laminated aluminum and polyester film.
5. Adhesive Lap: Self-adhesive, low-temperature acrylic, pressure-sensitive adhesive lap.
6. Permeance: 0.00 perm as tested in accordance with ASTM F1249.
7. Flamespread/Smoke Developed: 25/50 as tested in accordance with ASTM E84.
8. Aluminum Finish: **[Embossed][Smooth]** .
9. Outer Aluminum Surface: Coated with UV-resistant coating for protection from environmental contaminants.

2.14 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Mesh for Pipe Insulation, Field Applied:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Childers Brand; H. B. Fuller Construction Products]**
 - b. **<Insert manufacturer's name>**
3. Description: Woven glass-fiber mesh for covering pipe and pipe fittings insulation.
4. Weight: Approximately **2 oz./sq. yd. (68 g/sq. m).**
5. Thread Count: **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm).**

B. Woven Polyester Mesh for Pipe Insulation, Field Applied:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Foster Brand; H. B. Fuller]**
 - b. **[Vimasco Corporation]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Foster Brand; H. B. Fuller]**
 - b. **[Vimasco Corporation]**
 - c. **<Insert manufacturer's name>**
3. Description: Woven polyester mesh for covering pipe and pipe fittings insulation.
4. Weight: Approximately **1 oz./sq. yd. (34 g/sq. m).**
5. Thread Count: **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm).**
6. Weave Type: Leno.

2.15 FIELD-APPLIED CLOTHS FOR INSULATION

A. Woven Glass-Fiber Cloth, Field Applied, for Insulation:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Alpha Associates, Inc.]**
 - b. **<Insert manufacturer's name>**

3. Description: Woven glass-fiber cloth.
4. Standard: MIL-C-20079H, Type I.
5. Weave: Plain.
6. Weight: Minimum of 8 oz./sq. yd. (271 g/sq. m), presized.

2.16 VAPOR-RETARDER TAPES

A. Vapor-Retarder Tape for ASJ:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Aeroflex USA]**
 - c. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - d. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - e. **[Knauf Insulation]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Aeroflex USA]**
 - c. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - d. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - e. **[Knauf Insulation]**
 - f. **<Insert manufacturer's name>**
3. Description: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
4. Standard: ASTM C1136.
5. Width: **[3 inches (75 mm)]<Insert value>** .
6. Thickness: **[11.5 mils (0.29 mm)]<Insert value>** .
7. Adhesion: **[90 ounces force/inch (1.0 N/mm)]<Insert value>** in width.
8. Elongation: **[2]<Insert number>** percent.
9. Tensile Strength: **[40 lbf/inch (7.2 N/mm)]<Insert value>** in width.
10. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Vapor-Retarder Tape for FSK:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **<Insert manufacturer's name>**
3. Description: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive.
 4. Standard: ASTM C1136.
 5. Width: **[3 inches (75 mm)]<Insert value>** .
 6. Thickness: **[6.5 mils (0.16 mm)]<Insert value>** .
 7. Adhesion: **[90 ounces force/inch (1.0 N/mm)]<Insert value>** in width.
 8. Elongation: **[2]<Insert number>** percent.
 9. Tensile Strength: **[40 lbf/inch (7.2 N/mm)]<Insert value>** in width.
 10. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Vapor-Retarder Tape for PVC:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - c. **<Insert manufacturer's name>**
3. Description: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive.
4. Application: Suitable for indoor and outdoor applications.
5. Width: **[2 inches (50 mm)]<Insert value>** .
6. Thickness: **[6 mils (0.15 mm)]<Insert value>** .
7. Adhesion: **[64 ounces force/inch (0.7 N/mm)]<Insert value>** in width.
8. Elongation: **[500]<Insert value>** percent.
9. Tensile Strength: **[18 lbf/inch (3.3 N/mm)]<Insert value>** in width.

D. Vapor-Retarder Tape - Aluminum Foil:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**

- d. **[Knauf Insulation]**
 - e. **[Sekisui Voltek, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[3M Industrial Adhesives and Tapes Division]**
 - b. **[Avery Dennison Corporation, Specialty Tapes Division]**
 - c. **[Ideal Tape Co., Inc., an American Biltrite Company]**
 - d. **[Knauf Insulation]**
 - e. **[Sekisui Voltek, LLC]**
 - f. **<Insert manufacturer's name>**
3. Description: Aluminum-foil vapor-retarder tape with acrylic adhesive.
4. Width: **[2 inches (50 mm)]<Insert value>** .
5. Thickness: **[3.7 mils (0.093 mm)]<Insert value>** .
6. Adhesion: **[100 ounces force/inch (1.1 N/mm)]<Insert value>** in width.
7. Elongation: **[5]<Insert number>** percent.
8. Tensile Strength: **[34 lbf/inch (6.2 N/mm)]<Insert value>** in width.

2.17 INSULATION SECUREMENTS

A. Insulation Bands:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Johns Manville; a Berkshire Hathaway company]**
 - b. **[RPR Products, Inc.]**
 - c. **<Insert manufacturer's name>**
3. Insulation Bands - Stainless Steel: ASTM A240/A240M, **[Type 304][or][Type 316]** ; **0.015 inch (0.38 mm)** thick, **[1/2 inch (13 mm)][3/4 inch (19 mm)]** wide with **[wing seal][or][closed seal]** .
4. Insulation Bands - Aluminum: **ASTM B209 (ASTM B209M)**, Alloy 3003, 3005, 3105, or 5005; Temper H-14, **0.020 inch (0.51 mm)** thick, **[1/2 inch (13 mm)][3/4 inch (19 mm)]** wide with **[wing seal][or][closed seal]** .
5. Springs: Twin spring set constructed of stainless steel, with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

B. Insulation Staples: Outward clinching insulation staples, nominal **3/4 inch (19 mm)** wide, stainless steel or Monel.

C. Insulation Wire:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[C & F Wire Products]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[RPR Products, Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[C & F Wire Products]**
 - b. **[Johns Manville; a Berkshire Hathaway company]**
 - c. **[RPR Products, Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: **[0.080-inch (2.0-mm) nickel-copper alloy][0.062-inch (1.6-mm) soft-annealed, stainless steel][0.062-inch (1.6-mm) soft-annealed, galvanized steel]** .

2.18 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers, :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[Buckaroos, Inc.]**
 - b. **[McGuire Manufacturing]**
 - c. **[MVG Molded Products]**
 - d. **[Plumberex Specialty Products, Inc.]**
 - e. **[ProFlo; a Ferguson Enterprises, Inc. brand]**
 - f. **[Truebro; IPS Corporation]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Buckaroos, Inc.]**
 - b. **[McGuire Manufacturing]**
 - c. **[MVG Molded Products]**
 - d. **[Plumberex Specialty Products, Inc.]**
 - e. **[ProFlo; a Ferguson Enterprises, Inc. brand]**
 - f. **[Truebro; IPS Corporation]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
3. Description: Manufactured plastic wraps for covering plumbing fixture **[hot-water supply][hot-**

and cold-water supplies] and trap and drain piping. Comply with Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines requirements.

B. Protective Shielding Piping Enclosures, :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]** :
 - a. **[ProFlo; a Ferguson Enterprises, Inc. brand]**
 - b. **[Truebro; IPS Corporation]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ProFlo; a Ferguson Enterprises, Inc. brand]**
 - b. **[Truebro; IPS Corporation]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
3. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA and ABA Accessibility Guidelines requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that piping to be insulated has been tested and is free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer **5 mils (0.127 mm)** thick and an epoxy finish **5 mils (0.127 mm)** thick if operating in a temperature range of between **140 and 300 deg F (60 and 149 deg C)**. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature of between **32 and 300 deg F (0 and 149 deg C)** with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

- C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 INSTALLATION OF PIPING INSULATION, GENERAL

- A. Requirements in this article apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- E. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents [, **unless otherwise approved by the engineer-of-record**] .
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry

film thicknesses.

M. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
2. Cover circumferential joints with **3-inch- (75-mm-)** wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced **4 inches (100 mm)** o.c.
3. Overlap jacket longitudinal seams at least **1-1/2 inches (38 mm)**. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at **4 inches (100 mm)** o.c.
4. For below-ambient services, apply vapor-barrier mastic over staples.
5. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

N. Cut insulation in a manner to avoid compressing insulation.

O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **[4 inches (100 mm)]**<Insert value> beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

Q. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

R. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using **[preformed fitting insulation][or][mitered or routed fittings]** made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with **[preformed fitting insulation][or][sectional pipe insulation]** of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using **[preformed fitting insulation][or][sectional pipe insulation]** of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using **[preformed fitting insulation][or][sectional pipe insulation]** of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the

insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

- S. Insulate instrument connections for thermometers, pressure gauges, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

- T. Install removable insulation covers [**at locations indicated on Drawings**] . Installation conforms to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least **2 inches (50 mm)** over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least **2 inches (50 mm)** below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least **2 inches (50 mm)**.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations That Are Not Fire Rated: Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF CELLULAR-GLASS PIPE INSULATION

- A. Installation on:
 - 1. Straight Pipes and Tubes:
 - a. Secure each layer of insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
 - b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - c. For insulation with jackets on above-ambient services, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
 - d. For insulation with jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.
 - 2. Pipe Flanges:
 - a. Install prefabricated pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as that of pipe insulation. Where voids are difficult to fill with block insulation, fill the voids with a fibrous insulation material suitable for the specific operating temperature.
 - d. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.
 - 3. Pipe Fittings and Elbows:

- a. Install prefabricated sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
- b. When preformed sections of insulation are not available, install mitered or routed sections of cellular-glass insulation. Secure insulation materials with wire or bands.

4. Insulation Installation on Valves and Pipe Specialties:

- a. Install prefabricated sections of cellular-glass insulation to valve body.
- b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC PIPE INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation on:

1. Pipe Flanges:

- a. Install pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
- d. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

2. Pipe Fittings and Elbows:

- a. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
- b. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3. Valves and Pipe Specialties:

- a. Install prefabricated valve covers manufactured of same material as that of pipe insulation when available.
- b. When prefabricated valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.
- d. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- C. Finish: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.7 INSTALLATION OF GLASS-FIBER PIPE INSULATION

A. Insulation on:

1. Straight Pipes and Tubes:

- a. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
- b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
- c. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
- d. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

2. Pipe Flanges:

- a. Install prefabricated pipe insulation to outer diameter of pipe flange.
- b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
- d. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.

3. Pipe Fittings and Elbows:

- a. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
- b. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

4. Valves and Pipe Specialties:

- a. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
- b. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
- c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- d. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF PHENOLIC PIPE INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless steel bands at **12-inch (300-mm)** intervals, and tighten bands without deforming insulation materials.
2. Install two-layer insulation with joints tightly butted and staggered at least **3 inches (75 mm)**. Secure inner layer with **0.062-inch (1.6-mm)** wire spaced at **12-inch (300-mm)** intervals. Secure outer layer with stainless steel bands at **12-inch (300-mm)** intervals.

B. Insulation on:

1. Straight Pipes and Tubes:
 - a. Secure each layer of insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
 - b. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - c. For insulation with jackets on above-ambient services, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
 - d. For insulation with jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.
2. Pipe Flanges:
 - a. Install prefabricated pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as that of pipe insulation. Where voids are difficult to fill with block insulation, fill the voids with a fibrous insulation material suitable for the specific operating temperature.
3. Pipe Fittings and Elbows:
 - a. Install preformed insulation sections of same material as that of straight segments of pipe insulation. Secure according to manufacturer's written instructions.
4. Valves and Pipe Specialties:
 - a. Install preformed insulation sections of same material as that of straight segments of pipe insulation. Secure according to manufacturer's written instructions.
 - b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - c. Install insulation to flanges as specified for flange insulation application.

3.9 INSTALLATION OF POLYOLEFIN PIPE INSULATION

A. Insulation on:

1. Straight Pipes and Tubes:
 - a. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive [, **or via self-seal mechanism**] to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Pipe Flanges:
 - a. Install pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as that of pipe insulation.
 - d. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive

to eliminate openings in insulation that allow passage of air to surface being insulated.

3. Pipe Fittings and Elbows:

- a. Install mitered sections of polyolefin pipe insulation.
- b. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

4. Valves and Pipe Specialties:

- a. Install cut sections of polyolefin pipe and sheet insulation to valve body.
- b. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- c. Install insulation to flanges as specified for flange insulation application.
- d. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.10 INSTALLATION OF WOVEN GLASS-FIBER CLOTH

A. Where woven glass-fiber jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with **2-inch (50-mm)** overlap at seams and joints.
2. Embed glass cloth between two **0.062-inch- (1.6-mm-)** thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

3.11 INSTALLATION OF FIELD-APPLIED INSULATION JACKETS

A. Insulation Jacket, Field-Applied - FSK:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with **1-1/2-inch (38-mm)** laps at longitudinal seams and **3-inch- (75-mm-)** wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Insulation Jacket, Field-Applied - PVC:

1. Install with **1-inch (25-mm)** overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
2. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Insulation Jacket, Field-Applied - Metal:

1. Install with **2-inch (50-mm)** overlap at longitudinal seams and end joints.
2. Overlap longitudinal seams arranged to shed water.
3. Seal end joints with weatherproof sealant recommended by insulation manufacturer.
4. Secure jacket with stainless steel bands **12 inches (300 mm)** o.c. and at end joints.

3.12 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: **[Two]<Insert number>** finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless steel jackets.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative] .**
- D. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to **[three]<Insert number>** locations of straight pipe, **[three]<Insert number>** locations of threaded fittings, **[three]<Insert number>** locations of welded fittings, **[two]<Insert number>** locations of threaded strainers, **[two]<Insert number>** locations of welded strainers, **[three]<Insert number>** locations of threaded valves, and **[three]<Insert number>** locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- E. All insulation applications will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.14 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water Piping:

1. Insulation for pipe size NPS 1 (DN 25) and smaller is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
2. Insulation for pipe size NPS 1-1/4 (DN 32) and larger is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

B. Domestic Hot and Recirculated Hot Water Piping:

1. Insulation for pipe size NPS 1-1/4 (DN32) and smaller is to be one of the following:
 - a. Pipe Insulation - Cellular Glass Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
2. Insulation for pipe size NPS 1-1/2 (DN 40) and larger is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

C. Domestic Chilled Water (Potable) Piping:

1. Insulation for all pipe sizes is to be one of the following:

- a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
- b. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
- c. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- d. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
- f. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

D. Stormwater and Overflow Piping:

1. Insulation for all pipe sizes is to be one of the following:

- a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
- b. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
- c. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- d. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
- f. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

E. Roof Drain and Overflow Drain Bodies:

1. Insulation for all pipe sizes is to be one of the following:

- a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
- b. Pipe Insulation - Flexible Elastomeric: [1 inch (25 mm)]<Insert dimension> thick.
- c. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- d. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
- f. Pipe Insulation - Polyolefin: [1 inch (25 mm)]<Insert dimension> thick.

F. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. Insulation for all pipe sizes is to be one of the following:

- a. Pipe Insulation - Flexible Elastomeric: [1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
- b. Pipe Insulation - Glass-Fiber, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
- c. Pipe Insulation - Mineral Wool, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
- d. Pipe Insulation - Polyolefin: [1/2 inch (13 mm)][3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.

G. Sanitary Waste Piping Where Heat Tracing Is Installed:

1. Insulation for all pipe sizes is to be one of the following:

- a. Pipe Insulation - Cellular Glass: [2 inches (50 mm)]<Insert dimension> thick.
- b. Pipe Insulation - Glass-Fiber, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
- c. Pipe Insulation - Mineral Wool, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.

- d. Pipe Insulation - Phenolic: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - H. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet (3 m) of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):
 - 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [1/2 inch (13 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [1 inch (25 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [3/4 inch (19 mm)][1 inch (25 mm)]<Insert dimension> thick.
 - I. Hot Service Drains and Piping:
 - 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - J. Hot Service Vent Piping:
 - 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [1-1/2 inches (38 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: [1 inch (25 mm)]<Insert dimension> thick.
- 3.16 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE
- A. Domestic Water Piping:
 - 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [2 inches (50 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [2 inches (50 mm)]<Insert dimension> thick.
 - c. Pipe Insulation - Glass-Fiber, Preformed: [2 inches (50 mm)]<Insert dimension> thick.
 - d. Pipe Insulation - Mineral Wool, Preformed: [2 inches (50 mm)]<Insert dimension> thick.
 - e. Pipe Insulation - Phenolic: [2 inches (50 mm)]<Insert dimension> thick.
 - f. Pipe Insulation - Polyolefin: [2 inches (50 mm)]<Insert dimension> thick.
 - B. Domestic Hot and Recirculated Hot Water Piping:
 - 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: [2 inches (50 mm)]<Insert dimension> thick.
 - b. Pipe Insulation - Flexible Elastomeric: [2 inches (50 mm)]<Insert dimension> thick.

- c. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
- d. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
- e. Pipe Insulation - Phenolic: **[2 inches (50 mm)]<Insert dimension>** thick.
- f. Pipe Insulation - Polyolefin: **[2 inches (50 mm)]<Insert dimension>** thick.

C. Sanitary Waste Piping Where Heat Tracing Is Installed:

- 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: **[2 inches (50 mm)]<Insert dimension>** thick.
 - d. Pipe Insulation - Phenolic: **[2 inches (50 mm)]<Insert dimension>** thick.

D. Hot Service Drains and Piping:

- 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: **[1-1/2 inches (38 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: **[1 inch (25 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: **[1 inch (25 mm)]<Insert dimension>** thick.

E. Hot Service Vent Piping:

- 1. Insulation for all pipe sizes is to be one of the following:
 - a. Pipe Insulation - Cellular Glass, Preformed: **[1-1/2 inches (38 mm)]<Insert dimension>** thick.
 - b. Pipe Insulation - Glass-Fiber, Preformed: **[1 inch (25 mm)]<Insert dimension>** thick.
 - c. Pipe Insulation - Mineral Wool, Preformed: **[1 inch (25 mm)]<Insert dimension>** thick.

3.17 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

- A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed: Pipe insulation - cellular glass, preformed **[2 inches (50 mm)]<Insert dimension>** thick.
- B. Chilled Water, All Sizes: Pipe insulation - cellular glass, preformed **[2 inches (50 mm)]<Insert dimension>** thick.

3.18 INDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed from View:
 - 1. None.
 - 2. PVC: **[Standard][Color-coded by system]** .

- a. Thickness: [20 mils (0.5 mm)][30 mils (0.8 mm)] .
 - 3. Aluminum: [Smooth][Corrugated][Stucco embossed] .
 - a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)] .
 - 4. Painted Aluminum: [Smooth][Corrugated][Stucco embossed] .
 - a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)] .
 - 5. Stainless Steel: [Type 304][or][Type 316] , [smooth No. 2B finish][corrugated][stucco embossed] .
 - a. Thickness: [0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)] .
- D. Piping, Exposed to View:
- 1. None.
 - 2. PVC: [Standard][Color-coded by system] .
 - a. Thickness: [20 mils (0.5 mm)][30 mils (0.8 mm)] .
 - 3. Aluminum: [Smooth][Corrugated][Stucco embossed] .
 - a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)] .
 - 4. Painted Aluminum: [Smooth][Corrugated][Stucco embossed] .
 - a. Thickness: [0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)] .
 - 5. Stainless Steel: [Type 304][or][Type 316] , [smooth No. 2B finish][corrugated][stucco embossed] .
 - a. Thickness: [0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)] .
- 3.19 OUTDOOR, FIELD-APPLIED INSULATION JACKET SCHEDULE
- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
 - B. If more than one material is listed, selection from materials listed is Contractor's option.
 - C. Piping, Concealed from View:
 - 1. None.
 - 2. PVC: [Standard][Color-coded by system] .
 - a. Thickness: [20 mils (0.5 mm)][30 mils (0.8 mm)] .

3. Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
4. Painted Aluminum: **[Smooth][Corrugated][Stucco embossed]** .
 - a. Thickness: **[0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)][0.032 inch (0.81 mm)]** .
5. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth No. 2B finish][corrugated][stucco embossed]** .
 - a. Thickness: **[0.010 inch (0.25 mm)][0.016 inch (0.41 mm)][0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

D. Piping, Exposed to View:

1. PVC: **[Standard][Color-coded by system]** .
 - a. Thickness: **[20 mils (0.5 mm)][30 mils (0.8 mm)][40 mils (1.0 mm)]** .
2. Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
3. Painted Aluminum: **[Smooth][Stucco embossed]** with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.032 inch (0.81 mm)][0.040 inch (1.0 mm)]** .
4. Stainless Steel: **[Type 304][or][Type 316]** , **[smooth][stucco embossed]** , with **[1-1/4-inch- (32-mm-) deep corrugations][2-1/2-inch- (65-mm-) deep corrugations][4-by-1-inch (100-by-25-mm) box ribs]** .
 - a. Thickness: **[0.020 inch (0.51 mm)][0.024 inch (0.61 mm)]** .

3.20 UNDERGROUND, FIELD-APPLIED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 22 07 19 00



Task	Specification	Specification Description
22 07 19 00	21 07 00 00	Fire-Suppression Systems Insulation



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SECTION 22 11 00 00 - GRAY-WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. PVC water pipe and fittings.
3. PP pipe and fittings.
4. Piping joining materials.
5. Transition fittings.
6. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper tube and fittings.
2. PVC water pipe and fittings.
3. PP pipe and fittings.
4. Piping joining materials.
5. Transition fittings.
6. Dielectric fittings.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Water Piping Minimum Working Pressure: [50 psig (345 kPa)][80 psig (552 kPa)][100 psig (690 kPa)]<Insert value> unless otherwise indicated.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: [ASTM B88, Type L (ASTM B88M, Type B)][and][ASTM B88, Type M (ASTM B88M, Type C)] water tube, drawn temper.

- B. Soft Copper Tube: [ASTM B88, Type K (ASTM B88M, Type A)][and][ASTM B88, Type L (ASTM B88M, Type B)] water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
 - b. [FNW; Ferguson Enterprises, Inc.]
 - c. [NIBCO INC.]
 - d. [Victaulic Company]
 - e. [Viega LLC]
 - f. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
 - b. [FNW; Ferguson Enterprises, Inc.]
 - c. [NIBCO INC.]
 - d. [Victaulic Company]
 - e. [Viega LLC]
 - f. <Insert manufacturer's name>
 - 3. Fittings for NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 4. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- H. Copper Push-on-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]
 - b. [Victaulic Company]

- c. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
 - b. **[Victaulic Company]**
 - c. **<Insert manufacturer's name>**
 - 3. Description:
 - a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
 - b. Stainless steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.
- I. Copper-Tube, Extruded-Tee Connections:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**
 - 3. Description: Tee formed in copper tube according to ASTM F2014.
- J. Appurtenances for Grooved-End Copper Tubing:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Victaulic Company]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Victaulic Company]**
 - d. **<Insert manufacturer's name>**

3. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B75/B75M copper tube or ASTM B584 bronze castings.
4. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: **300 psig (2070 kPa)**.
- K. Copper DWV Tube: ASTM B306, drainage tube, drawn temper.
- L. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

2.3 PVC WATER PIPE AND FITTINGS

- A. PVC Water Pipe: ASTM D1785, [**Schedule 40**][and][**Schedule 80**][purple in color].
- B. PVC Water Socket Fittings: [**ASTM D2466 for Schedule 40**][and][**ASTM D2467 for Schedule 80**][purple in color].
- C. PVC Water Schedule 80 Threaded Fittings: ASTM D2464.

2.4 PP PIPE AND FITTINGS

- A. PP Water Pipe: ASTM F2389, [**SDR 7.4**][and][**SDR 11**][purple in color].
- B. PP Water Socket Fittings: ASTM F2389[, **purple in color**].

2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 1. AWWA C110/A21.10, rubber, flat face, **1/8 inch (3.2 mm)** thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B32, lead-free alloys.
- D. Flux: ASTM B813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.
 1. Adhesive primer shall have a VOC content of 550 g/L or less.
 2. Adhesive primer shall comply with the testing and product requirements of the California

3. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
4. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
5. Solvent cement shall have a VOC content of 510 g/L or less.
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
7. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
8. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- G. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

- C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Cascade Waterworks Mfg. Co.]**
- b. **[Ford Meter Box Company, Inc. (The)]**
- c. **[JCM Industries, Inc]**
- d. **[Romac Industries, Inc.]**
- e. **[Smith-Blair, a Xylem brand.]**
- f. **[Viking Johnson]**
- g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the

following:

- a. [Cascade Waterworks Mfg. Co.]
- b. [Ford Meter Box Company, Inc. (The)]
- c. [JCM Industries, Inc]
- d. [Romac Industries, Inc.]
- e. [Smith-Blair, a Xylem brand.]
- f. [Viking Johnson]
- g. <Insert manufacturer's name>

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Charlotte Pipe and Foundry Company]
 - b. [GF Piping Systems: Georg Fischer LLC]
 - c. [Spears Manufacturing Company]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Charlotte Pipe and Foundry Company]
 - b. [GF Piping Systems: Georg Fischer LLC]
 - c. [Spears Manufacturing Company]
 - d. <Insert manufacturer's name>
3. Description:
 - a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket[**or threaded**] end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Colonial Engineering, Inc.]
 - b. [NIBCO INC.]
 - c. [Spears Manufacturing Company]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Colonial Engineering, Inc.]
 - b. [NIBCO INC.]
 - c. [Spears Manufacturing Company]

d. <Insert manufacturer's name>

3. Description:

- a. PVC four-part union.
- b. Brass threaded end.
- c. Solvent-cement-joint[**or threaded**] plastic end.
- d. Rubber O-ring.
- e. Union nut.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Capitol Manufacturing Company]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [HART Industrial Unions, LLC]
 - e. [Jomar Valve]
 - f. [Matco-Norca]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Capitol Manufacturing Company]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [HART Industrial Unions, LLC]
 - e. [Jomar Valve]
 - f. [Matco-Norca]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
- 3. Standard: ASSE 1079.
- 4. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][250 psig (1725 kPa)]<Insert values>.
- 5. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Capitol Manufacturing Company]
- b. [GF Piping Systems: Georg Fischer LLC]
- c. [Matco-Norca]
- d. [WATTS; A Watts Water Technologies Company]
- e. [Zurn Industries, LLC]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Capitol Manufacturing Company]
- b. [GF Piping Systems: Georg Fischer LLC]
- c. [Matco-Norca]
- d. [WATTS; A Watts Water Technologies Company]
- e. [Zurn Industries, LLC]
- f. <Insert manufacturer's name>

3. Standard: ASSE 1079.
4. Factory-fabricated, bolted, companion-flange assembly.
5. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][175 psig (1200 kPa)][300 psig (2070 kPa)]<Insert values>.
6. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Advance Products & Systems, LLC]
- b. [CALPICO, Inc.]
- c. [GF Piping Systems: Georg Fischer LLC]
- d. [GPT; a division of EnPRO Industries]
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Advance Products & Systems, LLC]
- b. [CALPICO, Inc.]
- c. [GF Piping Systems: Georg Fischer LLC]
- d. [GPT; a division of EnPRO Industries]
- e. <Insert manufacturer's name>

3. Nonconducting materials for field assembly of companion flanges.
4. Pressure Rating: [150 psig (1035 kPa)]<Insert value>.
5. Gasket: Neoprene or phenolic.
6. Bolt Sleeves: Phenolic or PE.

7. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Elster Perfection; Honeywell]**
 - c. **[Matco-Norca]**
 - d. **[Precision Plumbing Products]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Elster Perfection; Honeywell]**
 - c. **[Matco-Norca]**
 - d. **[Precision Plumbing Products]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
3. Standard: IAPMO PS 66.
4. Electroplated steel nipple complying with ASTM F1545.
5. Pressure Rating and Temperature: **[300 psig (2070 kPa) at 225 deg F (107 deg C)]<Insert values>**.
6. End Connections: Male threaded or grooved.
7. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for gray-water piping to verify actual locations of piping connections before **[equipment][fixture]** installation.
- C. Examine walls, floors, roofs, and **<Insert description>** for suitable conditions where gray-water piping will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of gray-water

water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A674 or AWWA C105/A21.5.
- D. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."
- P. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 220500 "Common Work Results for Plumbing."
- Q. Install shutoff valve, hose-end drain valve, strainer, pressure gauge, and test tee with valve inside the building at each gray-water water-service entrance. Comply with requirements for pressure gauges in Section 220500 "Common Work Results for Plumbing" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- R. Install shutoff valve immediately upstream of each dielectric fitting.
- S. Install gray-water water piping level [**with 0.25 percent slope downward toward drain**][without pitch] and plumb.

- T. Install pressure gauges on suction and discharge piping for each plumbing pump. Comply with requirements for pressure gauges in Section 220500 "Common Work Results for Plumbing."
- U. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

3.3 WATER PIPE JOINT CONNECTIONS

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gauge. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for gray-water water service. Join flanges with gasket and bolts according to ASME B31.9.
- K. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. PVC Piping: Join according to ASTM D2855.
- L. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF TRANSITION FITTINGS

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Drainage Piping: **[Unshielded][Shielded]**, nonpressure transition couplings.
 - 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
 - 4. In Underground Force Main Piping:
 - a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
 - b. NPS 2 (DN 50) and Larger: Pressure transition couplings.
- C. Transition Fittings in Aboveground Gray-Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition **[fittings][or][unions]**.
- D. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric **[nipples][unions]**.
 - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric **[flanges][flange kits][nipples]**.
 - 4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF VALVES

- A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- B. Shutoff Valves:
 - 1. Install gate or full-port ball valve for piping **NPS 2 (DN 50)** and smaller.
 - 2. Install gate valve for piping **NPS 2-1/2 (DN 65)** and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install vinyl-coated hangers for **[PVC][and][PP]** piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within **[12 inches (300 mm)]<Insert dimension>** of each fitting and coupling.
- F. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of **[PVC][and][PP]** piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.
- C. Label all non-potable water piping "NON-POTABLE, DO NOT DRINK."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-In Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Water Piping Tests" Subparagraph and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 2. Water Piping Tests:
 - a. Fill gray-water piping. Check components to determine that they are not air bound and that

- b. piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced gray-water water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of **50 psig (345 kPa)** above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Gray-water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 GRAY-WATER PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, gray-water piping, NPS 3 (DN 80) and smaller, is to be **[one of]** the following:
 1. **[Hard][or][soft]** copper tube, **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)]**; **[wrought-copper, solder-joint fittings; and brazed][copper pressure-seal fittings; and pressure-sealed]** joints.
 2. PVC, **[Schedule 40][Schedule 80]**; socket fittings; and solvent-cemented joints.

3. PP, [SDR 7.4][SDR 11] socket fittings; and fusion-welded joints.
 - E. Under-building-slab, gray-water piping, NPS 4 (DN 100) and larger, is to be the following:
 1. PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 2. PP, [SDR 7.4][SDR 11] socket fittings; and fusion-welded joints.
 - F. Aboveground gray-water piping, NPS 2 (DN 50) and smaller, is to be the following:
 1. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; [cast-][or][wrought]-copper, solder-joint fittings; and [brazed][soldered] joints.
 2. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][or][ASTM B88, Type M (ASTM B88M, Type C)]; copper pressure-seal-joint fittings; and pressure-sealed joints.
 3. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][or][ASTM B88, Type M (ASTM B88M, Type C)]; copper push-on-joint fittings; and push-on joints.
 4. PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 5. PP, [SDR 7.4][SDR 11] socket fittings; and fusion-welded joints.
 - G. Aboveground gray-water piping, [NPS 2-1/2 to NPS 4 (DN 65 to DN 100)]<Insert pipe size range>, is to be the following:
 1. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; [cast-][or][wrought]-copper, solder-joint fittings; and [brazed][soldered] joints.
 2. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][or][ASTM B88, Type M (ASTM B88M, Type C)]; copper pressure-seal-joint fittings; and pressure-sealed joints.
 3. Hard copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][or][ASTM B88, Type M (ASTM B88M, Type C)]; grooved-joint, copper-tube appurtenances; and grooved joints.
 4. PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 5. PP, [SDR 7.4][SDR 11] socket fittings; and fusion-welded joints.
 - H. Aboveground gray-water piping, NPS 5 (DN 125) and larger, is to be PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
- 3.11 VALVE SCHEDULE
- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball or gate valves for piping **NPS 2 (DN 50)** and smaller. Use butterfly, ball, or gate valves with flanged ends for piping **NPS 2-1/2 (DN 65)** and larger.
 2. Throttling Duty: Use ball or globe valves for piping **NPS 2 (DN 50)** and smaller. Use butterfly or ball valves with flanged ends for piping **NPS 2-1/2 (DN 65)** and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: [Calibrated][Memory-stop] balancing valves.
 4. Drain Duty: Hose-end drain valves.
 - B. Use check valves to maintain correct direction of gray-water water flow to and from equipment.
 - C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 22 11 00 00



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SECTION 22 11 16 00 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.
2. Ductile-iron pipe and fittings - domestic water.
3. Galvanized-steel pipe and fittings - domestic water.
4. Stainless steel piping and fittings - domestic water.
5. CPVC piping - domestic water.
6. PEX tube and fittings - domestic water.
7. PEX-AL-PEX tube and fittings - domestic water.
8. PEX-AL-HDPE tube and fittings - domestic water.
9. PVC pipe and fittings - domestic water.
10. Polypropylene (PP-R and PP-RCT) pipe and fittings - domestic water.
11. Piping joining materials - domestic water.
12. Encasement for piping.
13. Transition fittings - domestic water.
14. Dielectric fittings - domestic water.

B. Related Requirements:

1. Section 331415 "Site Water Distribution Piping" for water-service piping[**and water meters**] outside the building from source to the point where water-service piping enters the building.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper tube and fittings - domestic water.
2. Ductile-iron pipe and fittings - domestic water.
3. Galvanized-steel pipe and fittings - domestic water.
4. Stainless steel piping and fittings - domestic water.
5. CPVC piping - domestic water.
6. PEX tube and fittings - domestic water.
7. PEX-AL-PEX tube and fittings - domestic water.
8. PEX-AL-HDPE tube and fittings - domestic water.
9. PVC pipe and fittings - domestic water.
10. Polypropylene (PP-R and PP-RCT) pipe and fittings - domestic water.
11. Piping joining materials - domestic water.
12. Encasement for piping.
13. Transition fittings - domestic water.
14. Dielectric fittings - domestic water.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

3. Environmental Product Declaration: For each product.
4. Health Product Declaration: For each product.
5. Environmental Product Declaration: For each product.
6. Environmental Product Declaration: For each product.
7. Environmental Product Declaration: For each product.
8. Third-Party Certifications: For each product.
9. Third-Party Certified Life Cycle Assessment: For each product.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Piping layout, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service in accordance with requirements indicated:
 1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[two]<Insert number>** days in advance of proposed interruption of water service.
 2. Do not interrupt water service without **[Architect's][Construction Manager's][Owner's]** written permission.

1.6 WARRANTY

- A. Polypropylene (PP-R and PP-RCT) Pipe and Fittings Manufacturer's Warranty: Manufacturer agrees to repair or replace PP-R and PP-RCT pipe and fittings that fail in materials or workmanship within 10 years from date of Substantial Completion.
 1. Warranty is to cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of piping system due to defects in materials or manufacturing.
 2. Warranty is to be in effect only upon submission by Contractor to manufacturer of valid pressure/leak documentation indicating that the system was tested and passed manufacturer's pressure/leak test.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

- A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372. **[Include marking "NSF-pw" on piping.]**

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

- A. Drawn-Temper Copper Tube: **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)][and][ASTM B88, Type M (ASTM B88M, Type C)].**
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - d. **<Insert manufacturer's name>**
- B. Annealed-Temper Copper Tube: **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)][and][ASTM B88, Type M (ASTM B88M, Type C)].**
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - d. **<Insert manufacturer's name>**

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2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - d. **<Insert manufacturer's name>**
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than **NPS 4 (DN 100)**.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than **NPS 4 (DN 100)**.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
 - b. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - c. **[NIBCO INC.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
 - b. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - c. **[NIBCO INC.]**
 - d. **<Insert manufacturer's name>**
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Do not use solder joints on pipe sizes greater than **NPS 4 (DN 100)**.
- F. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than **NPS 4 (DN 100)**.
- G. Wrought Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than **NPS 4 (DN 100)**.
- H. Copper-Tube, Mechanically Formed Tee Fitting - Domestic Water: For forming T-branch on copper water tube.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**
3. Description: Tee formed in copper tube in accordance with ASTM F2014.
- I. Grooved, Mechanical-Joint, Copper Tube Appurtenances - Domestic Water:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **[Victaulic Company]**
 - e. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain grooved, mechanical-joint copper tube appurtenances from single manufacturer.
 4. Grooved-End, Copper Fittings: ASTM B75/B75M copper tube or ASTM B584 bronze castings.
 5. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting, EPDM-rubber gasket, UL classified per NSF 61 and NSF 372, and rated for minimum **[180 deg F (80 deg C)]<Insert temperature>**, for use with ferrous housing and steel bolts and nuts; **300 psig (2060 kPa)** minimum CWP pressure rating.
- J. Pressure-Seal-Joint Fittings, Copper or Bronze - Domestic Water:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Conex Banninger - USA]**
 - c. **[Copper Press Brand; Merit Brass Company]**
 - d. **[Elkhart Brass Mfg. Co., Inc]**
 - e. **[FNW; Ferguson Enterprises, Inc.]**
 - f. **[Mueller Streamline Co.; a company of Mueller Industries]**
 - g. **[NIBCO INC.]**
 - h. **[Viega LLC]**
 - i. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
- b. **[Conex Banninger - USA]**
- c. **[Copper Press Brand; Merit Brass Company]**
- d. **[Elkhart Brass Mfg. Co., Inc]**
- e. **[FNW; Ferguson Enterprises, Inc.]**
- f. **[Mueller Streamline Co.; a company of Mueller Industries]**
- g. **[NIBCO INC.]**
- h. **[Viega LLC]**
- i. **<Insert manufacturer's name>**

3. Source Limitations: Obtain pressure-seal-joint fittings, copper or bronze, from single manufacturer.
4. Housing: Copper.
5. O-Rings and Pipe Stops: EPDM.
6. Tools: Manufacturer's special tools.
7. Minimum **200 psig (1370 kPa)** working-pressure rating at **250 deg F (121 deg C)**.

K. Copper-Tube, Push-on-Joint Fittings - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
- b. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
- c. **[NIBCO INC.]**
- d. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
- b. **[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems]**
- c. **[NIBCO INC.]**
- d. **<Insert manufacturer's name>**

3. Source Limitations: Obtain copper-tube, push-on-joint fittings from single manufacturer.
4. Description:

- a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
- b. Stainless steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.4 DUCTILE-IRON PIPE AND FITTINGS - DOMESTIC WATER

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- D. Push-on Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51.
 2. Push-on joint bell and plain spigot end unless grooved or flanged ends are indicated.
- E. Standard-Pattern, Push-on Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
 2. Gaskets: AWWA C111/A21.11, rubber.
- F. Compact-Pattern, Push-on Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
 2. Gaskets: AWWA C111/A21.11, rubber.
- G. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.
- H. Appurtenances for Grooved-End, Ductile-Iron Pipe - Domestic Water:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **[Smith-Cooper International]**
 - e. **[Star Pipe Products]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[ASC Engineered Solutions]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**

- d. [Smith-Cooper International]
 - e. [Star Pipe Products]
 - f. [Victaulic Company]
 - g. <Insert manufacturer's name>
- 3. Source Limitations: Obtain appurtenances for grooved-end, ductile-iron pipe from single manufacturer.
 - 4. Fittings for Grooved-End, Ductile-Iron Pipe: ASTM A47/A47M, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions that match pipe.
 - 5. Mechanical Couplings for Grooved-End, Ductile-Iron-Piping:
 - a. AWWA C606 for ductile-iron-pipe dimensions.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating:
 - 1) NPS 14 to NPS 18 (DN 350 to DN 450): [250 psig (1725 kPa)]<Insert value>.
 - 2) NPS 20 to NPS 46 (DN 500 to DN 900): [150 psig (1035 kPa)]<Insert value>.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS - DOMESTIC WATER

- A. Galvanized-Steel Pipe:
 - 1. ASTM A53/A53M, [Type E]<Insert type>, [Grade B]<Insert grade>, Standard Weight.
 - 2. Include ends matching joining method.
- B. Galvanized-Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Standard Weight, seamless steel pipe with threaded ends.
- C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- D. Malleable-Iron Unions:
 - 1. ASME B16.39, Class 150.
 - 2. Hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal, bronze seating surface.
 - 4. Threaded ends.
- E. Flanges: ASME B16.1, Class 125, cast iron.
- F. Appurtenances for Grooved-End, Galvanized-Steel Pipe - Domestic Water:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[ASC Engineered Solutions]**
 - d. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain appurtenance for grooved-end, galvanized-steel pipe from single manufacturer.
4. ASTM Fittings for Grooved-End, Galvanized-Steel Pipe: Galvanized, ASTM A47/A47M, malleable-iron casting; ASTM A106/A106M, steel pipe; or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
5. AWWA Fittings for Grooved-End, Galvanized-Steel Pipe:
 - a. AWWA C606 for steel-pipe dimensions.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating:
 - 1) NPS 8 (DN 200) and Smaller: **[600 psig (4137 kPa)]<Insert value>**.
 - 2) NPS 10 and NPS 12 (DN 250 to DN 300): **[400 psig (2758 kPa)]<Insert value>**.
 - 3) NPS 14 to NPS 24 (DN 350 to DN 600): **[250 psig (1725 kPa)]<Insert value>**.

2.6 STAINLESS STEEL PIPING AND FITTINGS - DOMESTIC WATER

- A. Potable-water piping and components are to comply with NSF 61 and NSF 372.
- B. Stainless Steel Pipe: ASTM A312/A312M, seamless, stainless steel of types and schedules as indicated in "Piping Applications" Article.
- C. Stainless Steel Pipe Fittings: ASTM A815/A815M.
- D. Appurtenances for Grooved-End, Stainless Steel Pipe - Domestic Water:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[ASC Engineered Solutions]**
 - d. **[GroovJoint]**
 - e. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [ASC Engineered Solutions]
 - d. [GroovJoint]
 - e. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - f. [Victaulic Company]
 - g. <Insert manufacturer's name>
3. Source Limitations: Obtain appurtenance for grooved-end, stainless steel pipe from single manufacturer.
 4. Fittings for Grooved-End, Stainless Steel Pipe: Stainless steel casting with dimensions matching stainless steel pipe.
 5. Mechanical Couplings for Grooved-End, Stainless Steel Pipe:
 - a. AWWA C606 for stainless steel pipe dimensions.
 - b. Stainless steel housing sections.
 - c. Stainless steel bolts and nuts.
 - d. EPDM-rubber gaskets suitable for hot and cold water.
 - e. Minimum Pressure Rating:
 - 1) NPS 8 (DN 200) and Smaller: **[600 psig (4137 kPa)]<Insert value>**.
 - 2) NPS 10 and NPS 12 (DN 250 to DN 300): **[400 psig (2758 kPa)]<Insert value>**.
 - 3) NPS 14 to NPS 24 (DN 350 to DN 600): **[250 psig (1725 kPa)]<Insert value>**.

E. Stainless Steel Piping, Pressure-Seal-Joint Fittings - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [GroovJoint]
 - c. [Merit Brass Company]
 - d. [Victaulic Company]
 - e. [Viega LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [GroovJoint]
 - c. [Merit Brass Company]
 - d. [Victaulic Company]
 - e. [Viega LLC]
 - f. <Insert manufacturer's name>
3. Source Limitations: Obtain stainless steel piping, pressure-seal-joint fittings from single manufacturer.
4. Material: Type 316 stainless steel, ASTM A312/A312M, **[Schedule 5][or][Schedule 10]**.
5. Fittings: Type 316 stainless steel with EPDM O-ring seal in each end, and approved for potable-water applications.
6. Listing: ICC-ES LC1002 or UL classified in accordance with NSF 61 and NSF 372.

7. Minimum **200 psig (1379 kPa)** working-pressure rating at **250 deg F (121 deg C)**.

2.7 CPVC PIPING - DOMESTIC WATER

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Charlotte Pipe and Foundry Company]**
 2. **[IPEX USA LLC]**
 3. **[Spears Manufacturing Company]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Charlotte Pipe and Foundry Company]**
 2. **[IPEX USA LLC]**
 3. **[Spears Manufacturing Company]**
 4. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain CPVC piping from single manufacturer.
- D. CPVC Pipe: ASTM F441/F441M, with wall thickness as indicated in "Piping Applications" Article.
 1. CPVC Socket Fittings: **[ASTM F438 for Schedule 40][and][ASTM F439 for Schedule 80]**.
 2. CPVC Threaded Fittings: ASTM F437, Schedule 80.
- E. CPVC Piping System: ASTM D2846/D2846M, SDR 11, pipe and socket fittings.
- F. CPVC Tubing System: ASTM D2846/D2846M, SDR 11, tube and socket fittings.

2.8 PEX TUBE AND FITTINGS - DOMESTIC WATER

- A. PEX Tube - Domestic Water:
 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[HeatLink Group Inc.]**
 - b. **[IPEX USA LLC]**
 - c. **[MrPex Systems Inc]**
 - d. **[NIBCO INC.]**
 - e. **[REHAU]**
 - f. **[SharkBite, A Division of Reliance Worldwide Corporation]**
 - g. **[Sioux Chief Manufacturing Company, Inc.]**
 - h. **[Uponor Inc.]**
 - i. **[Viega LLC]**
 - j. **[Warmboard, Inc.]**
 - k. **[Watts Radiant; A WATTS Brand]**
 - l. **[Zurn Industries, LLC]**
 - m. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[HeatLink Group Inc.]**
- b. **[IPEX USA LLC]**
- c. **[MrPex Systems Inc]**
- d. **[NIBCO INC.]**
- e. **[REHAU]**
- f. **[SharkBite, A Division of Reliance Worldwide Corporation]**
- g. **[Sioux Chief Manufacturing Company, Inc.]**
- h. **[Uponor Inc.]**
- i. **[Viega LLC]**
- j. **[Warmboard, Inc.]**
- k. **[Watts Radiant; A WATTS Brand]**
- l. **[Zurn Industries, LLC]**
- m. **<Insert manufacturer's name>**

3. Source Limitations: Obtain PEX tube from single manufacturer.

4. Tube Material: PEX plastic in accordance with ASTM F876[**and ASTM F877**].

B. PEX Tube Fittings - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[NIBCO INC.]**
- b. **[Oatey Co.]**
- c. **[SharkBite, A Division of Reliance Worldwide Corporation]**
- d. **[Uponor Inc.]**
- e. **[Zurn Industries, LLC]**
- f. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[NIBCO INC.]**
- b. **[Oatey Co.]**
- c. **[SharkBite, A Division of Reliance Worldwide Corporation]**
- d. **[Uponor Inc.]**
- e. **[Zurn Industries, LLC]**
- f. **<Insert manufacturer's name>**

3. Source Limitations: Obtain PEX tube fittings from single manufacturer.

4. Fittings: **[ASTM F1807, metal insert and copper crimp rings][ASTM F1960, cold expansion fittings and reinforcing rings]**.

5. Push-Fit Fittings: ASSE 1061, push-fit fittings.

- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F876; with plastic or corrosion-resistant-metal valve for each outlet.

2.9 PEX-AL-PEX TUBE AND FITTINGS - DOMESTIC WATER

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Heat Innovations Inc]**
 2. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Heat Innovations Inc]**
 2. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain PEX-AL-PEX tube and fittings from single manufacturer.
- D. Tube Material: PEX plastic bonded to inside and outside of a welded aluminum tube in accordance with ASTM F1281.
- E. Fittings: ASTM F1974, metal insert fittings with split ring and compression nut (compression joint) or metal insert fittings with copper crimp rings (crimp joint).

2.10 PEX-AL-HDPE TUBE AND FITTINGS - DOMESTIC WATER

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Uponor Inc.]**
 2. **[Viega LLC]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Uponor Inc.]**
 2. **[Viega LLC]**
 3. **<Insert manufacturer's name>**
- C. Source Limitations: Obtain PEX-AL-HDPE tube and fittings from single manufacturer.
- D. Fittings for PEX-AL-HDPE Tube: Metal-insert type with copper or stainless steel crimp ring and matching PEX-AL-HDPE tube dimensions.

2.11 PVC PIPE AND FITTINGS - DOMESTIC WATER

- A. PVC Pipe - Domestic Water: ASTM D1785, with wall thickness as indicated in "Piping Applications" Article.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Charlotte Pipe and Foundry Company]
- b. [Spears Manufacturing Company]
- c. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Charlotte Pipe and Foundry Company]
- b. [Spears Manufacturing Company]
- c. <Insert manufacturer's name>

3. Source Limitations: Obtain PVC pipe from single manufacturer.

B. PVC Socket Fittings: [ASTM D2466 for Schedule 40][and][ASTM D2467 for Schedule 80].

C. PVC Schedule 80 Threaded Fittings: ASTM D2464.

2.12 POLYPROPYLENE (PP-R AND PP-RCT) PIPE AND FITTINGS - DOMESTIC WATER

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1. [aquatherm]
- 2. [IPEX USA LLC]
- 3. [Nupi Americas]
- 4. [Uponor Inc.]
- 5. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1. [aquatherm]
- 2. [IPEX USA LLC]
- 3. [Nupi Americas]
- 4. [Uponor Inc.]
- 5. <Insert manufacturer's name>

C. Source Limitations: Obtain polypropylene (PP-R and PP-RCT) pipe and fittings from single manufacturer.

D. Polypropylene (PP-R and PP-RCT) Pipe and Fittings: ASTM F2389, pipe pressure rating to comply with temperature and pressure ratings of code requirements for applicable service.

- 1. Polypropylene Fittings: ASTM F2389, socket fusion, butt fusion, electrofusion, or fusion outlet fittings to be used for fusion-welded joints between pipe and fittings.
- 2. Mechanical fittings and transition fittings to be used where transitions are made to other piping materials or to valves and appurtenances.
- 3. Polypropylene pipe is to be unthreaded. Threaded transition fittings per ASTM F2389 to be used where a threaded connection is required.

E. Smoke and Fire Ratings:

1. Where indicated on Drawings that a plenum-rated piping system is required, pipe is to be wrapped and/or insulated with fiberglass or mineral-wool pipe insulation, and field installed.
2. System is to have a flame-spread index of less than 25 and smoke-developed index of less than 50.
3. Pipe, wrap, or insulate as a system to comply with requirements of CAN/ULC-S102.2-03, ASTM E84, or UL 2846.
4. For insulation required for thermal and condensation reasons, see Section 220719 "Plumbing Piping Insulation."

F. Integration of PP-R and PP-RCT Piping Systems with Other Systems:

1. When integrating PP-R and PP-RCT piping systems with other systems or with components not made of PP-R or PP-RCT (for example, valves, pumps, other piping, check valves, or strainers), ensure that operating parameters for PP-R and PP-RCT will not damage other materials in the system or vice versa.
2. Verify that all parts of the system are compatible with the medium being carried before installation. PP-R and PP-RCT pipe do not require treatment to protect them from corrosion. Metals (ferrous and non-ferrous) in the system may be susceptible to corrosion. Provide water treatment to protect system metals.
3. Do not mix PP-R and PP-RCT pipe with other piping systems in conditions that will cause the other system or components to fail.
4. For Domestic Hot Water Recirculation (DHWR) Systems:
 - a. When using copper piping in conjunction with PP-R and PP-RCT in a DHWR system, ensure that operating conditions will not cause degradation or erosion/corrosion of copper.
 - b. Follow CDA guidelines (CDA's "Copper Tube Handbook") for sizing, temperature, and flow velocity in the copper tubing.
 - c. Sustained high levels of copper in DHWR piping can damage components within the system, even PP-R and PP-RCT.
 - d. Ensure that maximum hot-water temperature within any part of the system/loop does not exceed **140 deg F (60 deg C)**. Some regulations and codes further restrict temperature at any fixture to maximum of **120 deg F (50 deg C)**. Do not exceed temperature rating of pipe for the operating pressure.
 - e. Maximum temperature used must not exceed rating of pipe for the operating pressure.
 - f. Flow rates in a DHWR system should not exceed **1.5 ft./sec (0.5 m/s)** anywhere in the system, except in some special cases where velocities up to **3 ft./sec (1 m/s)** are needed to achieve proper flow temperature.
 - g. When adding PP-R or PP-RCT to an existing copper system in a DHWR application, the level of copper in the water must be tested. Do not install PP-R or PP-RCT where dissolved copper levels exceed 0.1 mg/L (ppm).

G. PP-R and PP-RCT Socket Fittings: ASTM F2389.

2.13 PIPING JOINING MATERIALS - DOMESTIC WATER

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, **1/8 inch (3.2 mm)** thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder Filler Metals: ASTM B32, lead-free alloys.
- D. Flux: ASTM B813, water flushable.
- E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F493.
 - 1. Solvent cement shall have a VOC content of 490 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- G. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer in accordance with ASTM F656.
 - 1. Solvent cement shall have a VOC content of 510 g/L or less.
 - 2. Adhesive primer shall have a VOC content of 550 g/L or less.
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
 - 6. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 7. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 8. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.14 ENCASEMENT FOR PIPING

- A. Standard: ASTM A674 or AWWA C105/A21.5.
- B. Form: **[Sheet][or][tube]**.
- C. Color: **[Black][or][natural]<Insert color>**.

2.15 TRANSITION FITTINGS - DOMESTIC WATER

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Couplings - Domestic Water: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Cascade Waterworks Mfg. Co.]**
 - b. **[Dresser Pipeline Solutions]**
 - c. **[Ford Meter Box Company, Inc. (The)]**
 - d. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - e. **[JCM Industries, Inc]**
 - f. **[Romac Industries, Inc.]**
 - g. **[Smith-Blair, a Xylem brand.]**
 - h. **[Viking Johnson]**
 - i. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cascade Waterworks Mfg. Co.]**
 - b. **[Dresser Pipeline Solutions]**
 - c. **[Ford Meter Box Company, Inc. (The)]**
 - d. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - e. **[JCM Industries, Inc]**
 - f. **[Romac Industries, Inc.]**
 - g. **[Smith-Blair, a Xylem brand.]**
 - h. **[Viking Johnson]**
 - i. **<Insert manufacturer's name>**
 - 3. Source Limitations: Obtain sleeve-type transition couplings from single manufacturer.
- D. Plastic-to-Metal Transition Fittings - Domestic Water:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [aquatherm]
 - b. [Charlotte Pipe and Foundry Company]
 - c. [Sioux Chief Manufacturing Company, Inc.]
 - d. [Spears Manufacturing Company]
 - e. [Uponor Inc.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [aquatherm]
 - b. [Charlotte Pipe and Foundry Company]
 - c. [Sioux Chief Manufacturing Company, Inc.]
 - d. [Spears Manufacturing Company]
 - e. [Uponor Inc.]
 - f. <Insert manufacturer's name>
 3. Source Limitations: Obtain plastic-to-metal transition fittings from single source.
 4. Description:
 - a. [CPVC][or][PVC] one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket[or threaded] end.
- E. Plastic-to-Metal Transition Unions - Domestic Water:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [aquatherm]
 - b. [Colonial Engineering, Inc.]
 - c. [NIBCO INC.]
 - d. [Spears Manufacturing Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [aquatherm]
 - b. [Colonial Engineering, Inc.]
 - c. [NIBCO INC.]
 - d. [Spears Manufacturing Company]
 - e. <Insert manufacturer's name>
 3. Source Limitations: Obtain plastic-to-metal transition unions from single manufacturer.
 4. Description:
 - a. [CPVC][or][PVC] four-part union.
 - b. Brass[or stainless steel] threaded end.

- c. Solvent-cement-joint[**or threaded**] plastic end.
- d. Rubber O-ring.
- e. Union nut.

2.16 DIELECTRIC FITTINGS - DOMESTIC WATER

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[HART Industrial Unions, LLC]**
 - d. **[Jomar Valve]**
 - e. **[Matco-Norca]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[HART Industrial Unions, LLC]**
 - d. **[Jomar Valve]**
 - e. **[Matco-Norca]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
3. Source Limitations: Obtain dielectric unions from single manufacturer.
4. Standard: ASSE 1079.
5. Pressure Rating: **[125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][250 psig (1725 kPa)]<Insert value>**.
6. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Capitol Manufacturing Company]**
 - b. **[GF Piping Systems: Georg Fischer LLC]**
 - c. **[Matco-Norca]**
 - d. **[WATTS; A Watts Water Technologies Company]**

- e. **[Zurn Industries, LLC]**
- f. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Capitol Manufacturing Company]**
- b. **[GF Piping Systems: Georg Fischer LLC]**
- c. **[Matco-Norca]**
- d. **[WATTS; A Watts Water Technologies Company]**
- e. **[Zurn Industries, LLC]**
- f. **<Insert manufacturer's name>**

3. Source Limitations: Obtain dielectric flanges from single manufacturer.
4. Standard: ASSE 1079.
5. Factory-fabricated, bolted, companion-flange assembly.
6. Pressure Rating: **[125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][175 psig (1200 kPa)][300 psig (2070 kPa)]<Insert value>**.
7. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Products & Systems, LLC]**
 - b. **[CALPICO, Inc.]**
 - c. **[GPT; a division of EnPRO Industries]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Products & Systems, LLC]**
 - b. **[CALPICO, Inc.]**
 - c. **[GPT; a division of EnPRO Industries]**
 - d. **<Insert manufacturer's name>**
3. Source Limitations: Obtain dielectric-flange insulating kits from single manufacturer.
4. Nonconducting materials for field assembly of companion flanges.
5. Pressure Rating: **[150 psig (1035 kPa)]<Insert value>**.
6. Gasket: Phenolic, Temperature Rating: **[225 deg F (108 deg C)]<Insert temperature>**.
7. Bolt Sleeves: Phenolic or polyethylene.
8. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**

following]:

- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Matco-Norca]
 - d. [Sioux Chief Manufacturing Company, Inc.]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Anvil; an ASC Engineered Solution]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Matco-Norca]
 - d. [Sioux Chief Manufacturing Company, Inc.]
 - e. [Victaulic Company]
 - f. <Insert manufacturer's name>
3. Source Limitations: Obtain dielectric nipples from single manufacturer.
4. Standard: IAPMO PS 66.
5. Electroplated steel nipple complying with ASTM F1545.
6. Pressure Rating and Temperature: **[300 psig (2070 kPa) at 225 deg F (107 deg C)]<Insert values>**.
7. End Connections: Male threaded or grooved.
8. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller is to be the following:
 1. Annealed-temper copper tube, **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)]**; **[wrought-copper, solder-joint fittings; and brazed][copper pressure-seal fittings; and pressure-sealed]** joints.
 2. PVC, **[Schedule 40][Schedule 80]**; socket fittings; and solvent-cemented joints.
 3. Polypropylene (PP-R and PP-RCT), **[SDR 7.4][SDR 11]** pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 (DN 100 to DN 200) and larger is to be the following:
 1. Annealed-temper copper tube, **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)]**; wrought-copper, solder-joint fittings; and brazed joints.

2. Mechanical-joint, ductile-iron pipe; [**standard-]**[**or**][**compact-]**pattern, mechanical-joint fittings; and mechanical joints.
 3. Push-on joint, ductile-iron pipe; [**standard-]**[**or**][**compact-]**pattern, push-on joint fittings; and gasketed joints.
 4. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
 5. PVC, [**Schedule 40**][**Schedule 80**]; socket fittings; and solvent-cemented joints.
 6. Polypropylene (PP-R and PP-RCT), [**SDR 7.4**][**SDR 11**] pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12 (DN 150 to DN 300) is to be the following:
1. Mechanical-joint, ductile-iron pipe; [**standard-]**[**or**][**compact-]**pattern, mechanical-joint fittings; and mechanical joints.
 2. Push-on joint, ductile-iron pipe; [**standard-]**[**or**][**compact-]**pattern, push-on joint fittings; and gasketed joints.
 3. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
- G. Under-building-slab, domestic water piping, NPS 2 (DN 50) and smaller is to be the following:
1. [**Drawn-temper**][**or**][**annealed-temper**] copper tube, **ASTM B88, Type L (ASTM B88M, Type B); [wrought-copper, solder-joint fittings; and brazed][copper pressure-seal-joint fittings; and pressure-sealed]** joints.
 2. PVC, [**Schedule 40**][**Schedule 80**]; socket fittings; and solvent-cemented joints.
 3. Polypropylene (PP-R and PP-RCT), [**SDR 7.4**][**SDR 11**] pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- H. Aboveground domestic water piping, NPS 2 (DN 50) and smaller is to be the following:
1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
 2. Drawn-temper copper tube, [**ASTM B88, Type L (ASTM B88M, Type B)**][**ASTM B88, Type M (ASTM B88M, Type C)**]; [**cast-]**[**or**][**wrought-]**copper, solder-joint fittings; and [**brazed**][**soldered**] joints.
 3. Drawn-temper copper tube, [**ASTM B88, Type L (ASTM B88M, Type B)**][**ASTM B88, Type M (ASTM B88M, Type C)**]; copper pressure-seal-joint fittings; and pressure-sealed joints.
 4. Drawn-temper copper tube, [**ASTM B88, Type L (ASTM B88M, Type B)**][**ASTM B88, Type M (ASTM B88M, Type C)**]; copper push-on joint fittings; and push-on joints.
 5. Stainless steel, [**Schedule 5**][**or**][**Schedule 10**] pipe; pressure-seal-joint fittings; and pressure-sealed joints.
 6. CPVC, [**Schedule 40**][**Schedule 80**]; socket fittings; and solvent-cemented joints.
 7. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
 8. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints. [**NPS 1-1/2 (DN 40) and NPS 2 (DN 50) CPVC pipe with CPVC socket fittings may be used instead of tubing.**]
 9. PEX tube, **NPS 1 (DN 25)** and smaller.
 - a. Fittings for PEX tube:
 - 1) ASTM F1807, metal insert and copper crimp rings.
 - 2) ASTM F1960, cold expansion fittings and reinforcing rings.
 - 3) ASSE 1061, push-fit fittings.
 10. PEX-AL-PEX tube, **NPS 1 (DN 25)** and smaller; fittings for PEX-AL-PEX tube; and crimped joints.
 11. PVC, [**Schedule 40**][**Schedule 80**]; socket fittings; and solvent-cemented joints.
 12. Polypropylene (PP-R and PP-RCT), [**SDR 7.4**][**SDR 11**] pipe and socket fusion, butt fusion, fusion

outlet, or electrofusion fittings and joints.

- I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) is to be the following:
 1. Drawn-temper copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; [cast-][or][wrought-]copper, solder-joint fittings; and [brazed][soldered] joints.
 2. Drawn-temper copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; copper pressure-seal-joint fittings; and pressure-sealed joints.
 3. Drawn-temper copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; grooved-joint, copper-tube appurtenances; and grooved joints.
 4. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
 5. Galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
 6. Stainless steel, [Schedule 5][Schedule 10][Schedule 40] pipe; grooved-joint fittings, and grooved joints.
 7. CPVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 8. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
 9. PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 10. Polypropylene (PP-R and PP-RCT), [SDR 7.4][SDR 11] pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- J. Aboveground domestic water piping, NPS 5 to NPS 8 (DN 125 to DN 200), is to be the following:
 1. Drawn-temper copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; [cast-][or][wrought-]copper, solder-joint fittings; and [brazed][soldered] joints.
 2. Drawn-temper copper tube, [ASTM B88, Type L (ASTM B88M, Type B)][ASTM B88, Type M (ASTM B88M, Type C)]; grooved-joint, copper-tube appurtenances; and grooved joints.
 3. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
 4. Galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
 5. Stainless steel [Schedule 5][Schedule 10][Schedule 40] pipe, grooved-joint fittings, and grooved joints.
 6. CPVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 7. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
 8. PVC, [Schedule 40][Schedule 80]; socket fittings; and solvent-cemented joints.
 9. Polypropylene (PP-R and PP-RCT) [SDR 7.4][SDR 11] pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12 (DN 150 to DN 300) is to be the following:
 1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
 2. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
 3. Galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
 4. Stainless steel [Schedule 5][Schedule 10][Schedule 40] pipe, grooved-joint fittings, and grooved joints.

3.2 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.3 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water

piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install copper tubing under building slab in accordance with CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints in accordance with AWWA C600 and AWWA M41.
- D. Install underground **[copper tube][and][ductile-iron pipe]** in PE encasement in accordance with ASTM A674 or AWWA C105/A21.5.
- E. Install valves in accordance with Section 220523 "General-Duty Valves for Plumbing Piping."
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level **[with 0.25 percent slope downward toward drain][without pitch]** and plumb.
- H. Rough-in domestic water piping for water-meter installation in accordance with utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install PEX tube with loop at each change of direction of more than 90 degrees.
- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 220500 "Common Work Results for Plumbing."
- T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123.21 "Inline, Domestic Water Pumps."

- U. Install thermometers on[**inlet and**] outlet piping from each water heater. Comply with requirements for thermometers in Section 220500 "Common Work Results for Plumbing."
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube in accordance with ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Joint Construction for Grooved-End Copper Tubing: Make joints in accordance with AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- J. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints in accordance with AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- K. Joint Construction for Grooved-End Steel Piping: Make joints in accordance with AWWA C606. [**Square cut**][**Roll**] groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and

fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

- L. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts in accordance with ASME B31.9.
- M. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join in accordance with ASTM D2846/D2846M.
 - 3. PVC Piping: Join in accordance with ASTM D2855.
- N. Joints for PEX Tubing, ASTM: Join in accordance with ASTM F1807 for metal insert and copper crimp ring fittings and ASTM F1960 for cold expansion fittings and reinforcing rings.
- O. Joints for PEX Tubing, ASSE: Join in accordance with ASSE 1061 for push-fit fittings.
- P. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.5 INSTALLATION OF TRANSITION FITTINGS

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition **[fittings][or][unions]**.

3.6 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric **[couplings][couplings or nipples][nipples][unions]**.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric **[flanges][flange kits][nipples]**.
- D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Install hangers for [copper][ductile iron][galvanized steel][and][stainless steel][tube][and][pipe], with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install vinyl-coated hangers for [CPVC][PVC][and][PP-R/PP-RCT] pipe, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Install vinyl-coated hangers for PEX tube, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support horizontal piping within [12 inches (300 mm)]<Insert dimension> of each fitting.
- G. Support vertical runs of [copper][ductile iron][galvanized steel][and][stainless steel][tube][and][pipe] to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support vertical runs of [CPVC][PVC][and][PP-R/PP-RCT] pipe to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- I. Support vertical runs of PEX tube to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system in accordance with either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least **50 ppm (50 mg/L)** of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least **200 ppm (200 mg/L)** of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after installation and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of **50 psig (345 kPa)** above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Hydrostatic testing and documentation of test results for polypropylene (PP-R and PP-RCT) pipe to be in accordance with manufacturer's written instructions and submitted to manufacturer upon successful completion per warranty requirements.
- f. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- g. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 22 11 16 00



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SECTION 22 11 16 00A - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized-steel pipe and fittings.
4. Copper tube and fittings.
5. ABS pipe and fittings.
6. PVC pipe and fittings.
7. Specialty pipe fittings.
8. Encasement for underground metal piping.

B. Related Requirements:

1. Section 221429 "Sump Pumps" for storm drainage pumps.
2. Section 334200 "Stormwater Conveyance" for storm drainage piping outside the building.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized-steel pipe and fittings.
4. Copper tube and fittings.
5. ABS pipe and fittings.
6. PVC pipe and fittings.
7. Specialty pipe fittings.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, sections, elevations, and details.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:** Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.
- B. Seismic Qualification Certificates:** For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certificate is based and their installation requirements.

C. Field Quality-Control Reports: Inspection reports signed by authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Provide materials bearing label, stamp, or other markings of specified testing agency.

1.5 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[two]<Insert number>** days in advance of proposed interruption of storm drainage service.
2. Do not proceed with interruption of storm drainage service without **[Architect's][Construction Manager's][Owner's]** written permission.

1.6 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are to be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: **[10-foot head of water (30 kPa)]<Insert pressure>**.
2. Storm Drainage, Force-Main Piping: **[50 psig (345 kPa)][100 psig (690 kPa)][150 psig (1035 kPa)]<Insert pressure>**.

B. Seismic Performance: Storm drainage piping and support and installation to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified **[and the unit will be fully functional after the seismic event]**."
2. Component Importance Factor: **[1.5][1.0]**.
3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[AB & I Foundry; a part of the McWane family of companies]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[Tyler Pipe; a part of the McWane family of companies]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[AB & I Foundry; a part of the McWane family of companies]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[Tyler Pipe; a part of the McWane family of companies]**
 - 4. **<Insert manufacturer's name>**
- C. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Standard: ASTM A74.
 - 3. Class: **[Service weight][and][Extra heavy]** cast iron.
- D. Gaskets: ASTM C564, rubber.
- E. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[AB & I Foundry; a part of the McWane family of companies]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[Tyler Pipe; a part of the McWane family of companies]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[AB & I Foundry; a part of the McWane family of companies]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[Tyler Pipe; a part of the McWane family of companies]**

4. <Insert manufacturer's name>

C. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM A888 and CISPI 301.

D. Standard, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ANACO-Husky; a part of the McWane family of companies]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[Dallas Specialty & Mfg. Co.]**
 - d. **[Fernco Inc]**
 - e. **[Ideal Tridon Group]**
 - f. **[Matco-Norca]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ANACO-Husky; a part of the McWane family of companies]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[Dallas Specialty & Mfg. Co.]**
 - d. **[Fernco Inc]**
 - e. **[Ideal Tridon Group]**
 - f. **[Matco-Norca]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
3. Marked with CISPI collective trademark **[and NSF certification mark]**.
4. Standards: ASTM C1277 and CISPI 310.
5. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

E. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ANACO-Husky; a part of the McWane family of companies]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[Dallas Specialty & Mfg. Co.]**

- d. [Fernco Inc]
 - e. [Ideal Tridon Group]
 - f. [Matco-Norca]
 - g. [MIFAB, Inc]
 - h. [Mission Rubber Company, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. [ANACO-Husky; a part of the McWane family of companies]
 - b. [Charlotte Pipe and Foundry Company]
 - c. [Dallas Specialty & Mfg. Co.]
 - d. [Fernco Inc]
 - e. [Ideal Tridon Group]
 - f. [Matco-Norca]
 - g. [MIFAB, Inc]
 - h. [Mission Rubber Company, LLC]
 - i. <Insert manufacturer's name>
3. Standard: ASTM C1277 or ASTM C1540.
4. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

F. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. [MG Coupling]
 - b. [MIFAB, Inc]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. [MG Coupling]
 - b. [MIFAB, Inc]
 - c. <Insert manufacturer's name>
3. Standard: ASTM A1056.
4. Description: Two-piece ASTM A48/A48M, cast-iron housing; stainless steel bolts and nuts; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe: ASTM A53/A53M, Type E, standard-weight class. Include ends matching joining method.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [U.S. Steel]
- b. [Wheatland Tube; Zekelman Industries]
- c. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [U.S. Steel]
- b. [Wheatland Tube; Zekelman Industries]
- c. <Insert manufacturer's name>

B. Cast-Iron Drainage Fittings: [Galvanized,]ASME B16.12, threaded.

C. Steel-Pipe Pressure Fittings:

- 1. Steel Pipe Nipples: [Galvanized,]ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
- 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
- 3. Gray-Iron, Threaded Fittings: [Galvanized,]ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.

- 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
- 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - c. [Smith-Cooper International]
 - d. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Anvil; an ASC Engineered Solution]
 - b. [Shurjoint; a part of Aalberts Integrated Piping Systems]
 - c. [Smith-Cooper International]
 - d. <Insert manufacturer's name>
- 3. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping:
 - a. ASTM A536 ductile-iron castings.

- b. ASTM A234/A234M forged-steel fittings.

2.6 COPPER TUBE AND FITTINGS

A. Copper Tube:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Wieland Copper Products, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Cambridge-Lee Industries, LLC]**
 - b. **[Cerro Flow Products, LLC]**
 - c. **[Wieland Copper Products, LLC]**
 - d. **<Insert manufacturer's name>**
3. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.
4. Copper Tube, Drawn Temper: **ASTM B88, Type L and Type M (ASTM B88M, Type B and Type C).**
5. Copper Tube, Annealed Temper: **ASTM B88, Type L (ASTM B88M, Type B).**

B. Copper Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[NIBCO INC.]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[NIBCO INC.]**
 - b. **<Insert manufacturer's name>**
3. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
4. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
5. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
6. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.



- a. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
- b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.7 ABS PIPE AND FITTINGS

A. ABS Pipe:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[JM Eagle]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[JM Eagle]**
 - d. **<Insert manufacturer's name>**
3. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
4. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
5. Cellular-Core ABS Pipe: ASTM F1488, Schedule 40.

B. ABS Socket Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Charlotte Pipe and Foundry Company]**
 - b. **[NIBCO INC.]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Charlotte Pipe and Foundry Company]**
 - b. **[NIBCO INC.]**
 - c. **<Insert manufacturer's name>**
3. Standard: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.

4. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Solvent Cement: ASTM D2235.

1. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
2. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
3. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.8 PVC PIPE AND FITTINGS

A. PVC Pipe:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Charlotte Pipe and Foundry Company]**
 - b. **[JM Eagle]**
 - c. **[National Pipe and Plastic, Inc. (Oldcastle)]**
 - d. **[North America Pipe Corporation]**
 - e. **[Silver-line Plastics]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Charlotte Pipe and Foundry Company]**
 - b. **[JM Eagle]**
 - c. **[National Pipe and Plastic, Inc. (Oldcastle)]**
 - d. **[North America Pipe Corporation]**
 - e. **[Silver-line Plastics]**
 - f. **<Insert manufacturer's name>**
3. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
4. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.
5. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.

B. PVC Socket Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. [Charlotte Pipe and Foundry Company]
- b. [NIBCO INC.]
- c. [North America Pipe Corporation]
- d. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Charlotte Pipe and Foundry Company]
- b. [NIBCO INC.]
- c. [North America Pipe Corporation]
- d. <Insert manufacturer's name>

- 3. Standard: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- 4. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Adhesive Primer: ASTM F656.

- 1. Adhesive primer shall have a VOC content of 550 g/L or less.
- 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 3. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
- 4. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

D. Solvent Cement: ASTM D2564.

- 1. Solvent cement shall have a VOC content of 510 g/L or less.

2.9 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

- 1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
- 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
- 3. Unshielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- 1) [Dallas Specialty & Mfg. Co.]
- 2) [Fernco Inc]
- 3) [Mission Rubber Company, LLC]
- 4) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Dallas Specialty & Mfg. Co.]
- 2) [Fernco Inc]
- 3) [Mission Rubber Company, LLC]
- 4) <Insert manufacturer's name>

- c. Standard: ASTM C1173.

- d. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

- e. Sleeve Materials:

- 1) For Cast-Iron Soil Pipes: ASTM C564 rubber.
- 2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
- 3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Dallas Specialty & Mfg. Co.]
- 2) [Fernco Inc]
- 3) [Mission Rubber Company, LLC]
- 4) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Dallas Specialty & Mfg. Co.]
- 2) [Fernco Inc]
- 3) [Mission Rubber Company, LLC]
- 4) <Insert manufacturer's name>

- c. Standard: ASTM C1460.

- d. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

- e. End Connections: Same size as and compatible with pipes to be joined.

5. Pressure Transition Couplings:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Cascade Waterworks Mfg. Co.]
- 2) [EBAA Iron Sales, Inc.]
- 3) [Ford Meter Box Company, Inc. (The)]
- 4) [JCM Industries, Inc]
- 5) [Romac Industries, Inc.]
- 6) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Cascade Waterworks Mfg. Co.]
- 2) [EBAA Iron Sales, Inc.]
- 3) [Ford Meter Box Company, Inc. (The)]
- 4) [JCM Industries, Inc]
- 5) [Romac Industries, Inc.]
- 6) <Insert manufacturer's name>

- c. Standard: AWWA C219.
- d. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
- e. Center-Sleeve Material: [Manufacturer's standard][Carbon steel][Stainless steel][Ductile iron][Malleable iron].
- f. Gasket Material: Natural or synthetic rubber.
- g. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [A.Y. McDonald Mfg. Co.]
- 2) [HART Industrial Unions, LLC]
- 3) [Jomar Valve]
- 4) [Matco-Norca]
- 5) [WATTS; A Watts Water Technologies Company]
- 6) [Zurn Industries, LLC]
- 7) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [A.Y. McDonald Mfg. Co.]
- 2) [HART Industrial Unions, LLC]
- 3) [Jomar Valve]

- 4) [Matco-Norca]
 - 5) [WATTS; A Watts Water Technologies Company]
 - 6) [Zurn Industries, LLC]
 - 7) <Insert manufacturer's name>
 - c. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: [150 psig (1035 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][250 psig (1725 kPa)]<Insert pressure>.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [WATTS; A Watts Water Technologies Company]
 - 2) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [WATTS; A Watts Water Technologies Company]
 - 2) <Insert manufacturer's name>
 - c. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: [150 psig (1035 kPa) minimum at 180 deg F (82 deg C)][175 psig (1200 kPa)][300 psig (2070 kPa)]<Insert pressure and temperature>.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Advance Products & Systems, LLC]
 - 2) [GPT; a division of EnPRO Industries]
 - 3) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1) [Advance Products & Systems, LLC]
 - 2) [GPT; a division of EnPRO Industries]
 - 3) <Insert manufacturer's name>

c. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: **[150 psig (1035 kPa)]<Insert pressure>**.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel-backing washers.

5. Dielectric Nipples:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- 1) **[Anvil; an ASC Engineered Solution]**
- 2) **[Matco-Norca]**
- 3) **[Precision Plumbing Products]**
- 4) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Anvil; an ASC Engineered Solution]**
- 2) **[Matco-Norca]**
- 3) **[Precision Plumbing Products]**
- 4) **<Insert manufacturer's name>**

- c. Description: Electroplated steel nipple.
- d. Standards: ASTM F492, ASME B1.20.1.
- e. Pressure Rating: **[300 psig (2070 kPa) at 225 deg F (107 deg C)]<Insert pressure and temperature>**.
- f. End Connections: Male threaded or grooved.
- g. Lining: Inert and noncorrosive, propylene.

2.10 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A674 or AWWA C105/A 21.5.
- B. Material: **[High-density, crosslaminated polyethylene film of 0.004-inch (0.10-mm)][or][linear low-density polyethylene film of 0.008-inch (0.20-mm)]** minimum thickness.
- C. Form: **[Sheet][or][tube]**.
- D. Color: **[Black][or][natural]<Insert color>**.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
- B. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- C. Install piping in concealed locations.
 - 1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- L. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.
 - 1. Do not change direction of flow more than 90 degrees.
 - 2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of drainage piping in direction of flow is prohibited.
- M. Lay buried building piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- N. Install piping at the following minimum slopes unless otherwise indicated.
 - 1. Building Storm Drain: [1/4 inch per foot (2 percent)]<Insert number> downward in direction of

- flow for piping **NPS 3 (DN 80)** and smaller; [1/8 inch per foot (2 percent)][1/4 inch per foot (2 percent)]<Insert number> downward in direction of flow for piping **NPS 4 (DN 100)** and larger.
2. Horizontal Storm Drainage Piping: [1/4 inch per foot (2 percent)]<Insert number> downward in direction of flow.
- O. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Ch IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.
- P. Install steel piping in accordance with applicable plumbing code.
- Q. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."
- R. Install aboveground ABS piping in accordance with ASTM D2661.
- S. Install aboveground PVC piping in accordance with ASTM D2665.
- T. Install underground [**ABS**][and][**PVC**] piping in accordance with ASTM D2321.
- U. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.
1. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.
- V. Install force mains at elevations indicated.
- W. Plumbing Specialties:
1. Install backwater valves in storm drainage gravity-flow piping.
- a. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."
2. Install cleanouts in storm drainage gravity-flow piping in accessible locations.
- a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
3. Install drains in storm drainage gravity-flow piping.
- a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- X. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Y. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

- Z. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- AA. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.
- C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.
 - 1. Cut threads full and clean using sharp dies.
 - 2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 - b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 - c. Do not use pipe sections that have cracked or open welds.
- E. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.
- F. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendices.
 - 3. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendices.
- I. Joint Restraints and Sway Bracing:
 - 1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

- a. Provide axial restraint for pipe and fittings **[5 inches (125 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
- b. Provide rigid sway bracing for pipe and fittings **[4 inches (100 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction 45 degrees and greater.
- c. Provide rigid sway bracing for pipe and fittings **[5 inches (125 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction and branch openings.

3.4 INSTALLATION OF SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: **[Unshielded][Shielded]**, nonpressure transition couplings.
3. In Aboveground Force-Main Piping: Fitting-type transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric **[nipples][unions]**.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric **[flanges][flange kits][nipples]**.
4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF VALVES

A. General valve installation requirements for general-duty valve installations are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install **[gate][full port ball valve]** for piping **NS 2 (DN 50)** and smaller.
3. Install **[gate][butterfly]<Insert type>** valve for piping **NPS 2-1/2 (DN 65)** and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. **[Use normally closed type unless otherwise indicated.]**
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
1. Install **[carbon-steel]<Insert material>** pipe hangers for horizontal piping in noncorrosive environments.
 2. Install **[stainless steel][fiberglass]** pipe hangers for horizontal piping in corrosive environments.
 3. Install **[carbon-steel]<Insert material>** pipe support clamps for vertical piping in noncorrosive environments.
 4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install hangers for **[cast-iron][galvanized-steel][and][copper]** soil **[tubing][and][piping]**, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for **[ABS][and][PVC]** piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping and tubing within **12 inches (300 mm)** of each fitting[, **valve,**] and coupling.
- F. Support vertical **[cast-iron][galvanized steel][and][copper][tubing][and][piping]** to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.
- G. Support vertical **[ABS][and][PVC]** piping with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
1. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 2. Install horizontal backwater valves **[with cleanout cover flush with floor][in pit with pit cover flush with floor]<Insert description>**.
 3. Comply with requirements for **[backwater valves][cleanouts][and][drains]** specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

- E. Make connections in accordance with the following unless otherwise indicated:
 - 1. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed storm drainage piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Test Procedure:
 - a. Test storm drainage piping[, **except outside leaders,**] on completion of roughing-in.
 - b. Close openings in piping system and fill with water to point of overflow, but not less than **10-foot head of water (30 kPa)**.
 - c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
 - d. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 5. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of **50 psig (345 kPa)** above operating pressure, without exceeding pressure rating of piping system materials.
 - a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.10 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

3.11 PROTECTION

- A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day and when work stops.
- C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.12 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping [**NPS 6 (DN 150) and smaller**]<Insert pipe size range> is to be [**any of**] the following:
1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; [**CISPI**],[**heavy-duty**,] hubless-piping couplings; and coupled joints.
 3. Galvanized-steel pipe, drainage fittings, and threaded joints.
 4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 5. [**Solid-wall**][**Cellular-core**] ABS pipe, ABS socket fittings, and solvent-cemented joints.
 6. [**Solid-wall**][**Cellular-core**] PVC pipe, PVC socket fittings, and solvent-cemented joints.
 7. Dissimilar Pipe-Material Couplings: [**Unshielded**][**Shielded**], nonpressure transition couplings.
- C. Aboveground, storm drainage piping [**NPS 8 (DN 200) and larger**]<Insert pipe size range> is to be [

any of] the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI],[heavy-duty,]** hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
6. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

D. Underground storm drainage piping **[NPS 6 (DN 150) and smaller]<Insert pipe size range>** shall be **[any of]** the following:

1. **[Extra heavy][Service weight]**, cast-iron soil pipe and fittings; **[gaskets; and gasketed][caulking materials; and caulked]** joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI],[heavy-duty,][cast-iron,]** hubless-piping couplings; and coupled joints.
3. **[Solid-wall][Cellular-core]** ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

E. Underground, storm drainage piping **[NPS 8 (DN 200) and larger]<Insert pipe size range>** is to be **[any of]** the following:

1. **[Extra heavy][Service weight]**, cast-iron soil pipe and fittings; **[gaskets; and gasketed][caulking materials; and caulked]** joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI],[heavy-duty,][cast-iron,]** hubless-piping couplings; and coupled joints.
3. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Cellular-core, sewer and drain series, PVC pipe; PVC socket fittings; and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

F. Aboveground storm drainage force mains **[NPS 1-1/2 and NPS 2 (DN 40 and DN 50)]<Insert pipe size range>** is to be **[any of]** the following:

1. Hard copper tube, **Type L (Type B)** copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

G. Aboveground storm drainage force mains **[NPS 2-1/2 to NPS 6 (DN 65 to DN 150)]<Insert pipe size range>** is to be **[any of]** the following:

1. Hard copper tube, **Type L (Type B)** copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.
3. Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
4. Fitting-type transition couplings if dissimilar pipe materials.

END OF SECTION 22 11 16 00A

SECTION 22 11 16 00B - COMPRESSED-AIR PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Shape-memory-metal couplings.
3. Copper pressure-seal fittings.
4. Flexible pipe connectors.
5. Zone valve box assemblies.
6. Ball valves.
7. Check valves.
8. Compressed-air safety valves.
9. Pressure regulators.
10. Medical compressed-air service connections.
11. Compressed-air manifolds.
12. Compressed-air cylinder storage racks.

B. Related Requirements:

1. Section 115313 "Laboratory Fume Hoods" for compressed-air outlets in laboratory fume hoods.
2. Section 123553.13 "Metal Laboratory Casework" for compressed-air outlets in laboratory casework.
3. Section 123553.16 "Plastic-Laminate-Clad Laboratory Casework" for compressed-air outlets in laboratory casework.
4. Section 123553.19 "Wood Laboratory Casework" for compressed-air outlets in laboratory casework.
5. Section 123570 "Healthcare Casework" for compressed-air outlets in healthcare casework.
6. Section 221513 "General-Service Compressed-Air Piping" for general-service compressed-air piping and specialties.
7. Section 226119 "Compressed-Air Equipment for Laboratory and Healthcare Facilities" for air compressors and specialties.
8. Section 220963 "Medical Gas Alarms" for combined medical air, vacuum, and gas alarms.

1.2 DEFINITIONS

- A. Compressed-Air Piping Systems:** Include medical air, dental air, instrument air, and laboratory air.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data:** For [Installer][and][testing agency].



- B. Seismic Qualification Certificates: For compressed-air manifolds, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Material Certificates: Signed by Installer, certifying that medical compressed-air piping materials comply with requirements in NFPA 99 for positive-pressure medical gas systems.
- D. Brazing certificates.
- E. Field Quality-Control Reports: Brazing certificates.
- F. Source Quality Control Reports:
 - 1. Certificates of Shop Inspection and Data Report for Bulk Gas Storage Tanks: As required by ASME Boiler and Pressure Vessel Code, Section VIII.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Quick-Coupler Service Connections: Furnish complete noninterchangeable medical compressed-air pressure outlets.
 - a. Medical Air: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 - b. Instrument Air: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 - 2. D.I.S.S. Service Connections: Furnish complete medical compressed-air-pressure outlets complying with CGA V-5.
 - a. Medical Air D.I.S.S. No. 1160: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 - b. Instrument Air D.I.S.S. No. 1160: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Medical Air Piping Systems for Healthcare Facilities: In accordance with ASSE Standard #6010 **[and][NFPA 99]** for medical-gas-system installers.
2. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer in accordance with ASSE Standard #6040 **[and][NFPA 99]**.

B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the vacuum piping testing indicated, that is **[a member of the Medical Gas Professional Healthcare Organization or is]** an NRTL, and that is acceptable to authorities having jurisdiction.

1. Qualify testing personnel in accordance with ASSE Standard #6020 **[and][NFPA 99]** for medical-gas-system inspectors and ASSE Standard #6030 **[and][NFPA 99]** for medical-gas-system verifiers.

C. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications," or AWS B2.2/B2.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Medical air operating at **[50 to 55 psig (345 to 380 kPa)]<Insert values>**.

B. Dental air operating at **[80 to 100 psig (550 to 690 kPa)]<Insert values>**.

C. Instrument air operating at **[175 psig (1200 kPa)]<Insert value>**.

D. Laboratory air operating at **[50 psig (345 kPa)][100 psig (690 kPa)][125 psig (860 kPa)]<Insert value>**.

E. All positive-pressure compressed-air products including piping, tubing, fittings, valves, zone valve boxes, manifolds, and service connections **[for systems serving patients in healthcare facilities]** are required to be manufacturer cleaned, purged, and sealed as for oxygen service, in accordance with CGA G-4.1.

1. All are to be delivered plugged or capped by the manufacturer and are to be kept sealed until prepared for installation.

F. Seismic Performance: Compressed-air manifolds shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. The term "withstand" means "the manifold will remain in place without separation of any parts when subjected to the seismic forces specified **[and the manifold will be fully operational after the seismic event]**."
2. Component Importance Factor is **[1.5][1.0]**.
3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

- G. Comply with NFPA 99.

2.2 PIPES, TUBES, AND FITTINGS

- A. Comply with ASME B31.1 for laboratory air piping operating at more than **150 psig (1035 kPa)**.
- B. Comply with ASME B31.9 for laboratory air piping operating at **150 psig (1035 kPa)** or less.
- C. Copper Medical Gas Tube: ASTM B819, **[Type K][and][Type L]**, seamless, drawn temper. Include standard color marking "MED" or "OXY/MED" in green for Type K tube and in blue for Type L tube.
- D. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type.
- E. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.
- F. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.
 - 1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos free, **1/8-inch (3-mm)** maximum thickness, full-face type.
 - 2. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.
- G. Shape-Memory-Metal Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aerofit, Inc]**
 - b. **[CAMERON; A Schlumber Co.]**
 - c. **[Motion Industries]**
 - d. **[Smart Tap; Smart Technology, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aerofit, Inc]**
 - b. **[CAMERON; A Schlumber Co.]**
 - c. **[Motion Industries]**
 - d. **[Smart Tap; Smart Technology, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 3. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy.
- H. Copper Pressure-Seal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[FNW; Ferguson Enterprises, Inc.]**
 - c. **[Viega LLC]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[FNW; Ferguson Enterprises, Inc.]**
 - c. **[Viega LLC]**
 - d. **<Insert manufacturer's name>**
 3. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
 4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless steel grip ring and EPDM O-ring seal in each end.
- I. Flexible Pipe Connectors:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Flex-Hose Co., Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Hyspan Precision Products, Inc]**
 - d. **[Mercer Rubber Co]**
 - e. **[Metraflex Company (The)]**
 - f. **[Proco Products, Inc]**
 - g. **[Universal Metal Hose]**
 - h. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Flex-Hose Co., Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Hyspan Precision Products, Inc]**
 - d. **[Mercer Rubber Co]**
 - e. **[Metraflex Company (The)]**
 - f. **[Proco Products, Inc]**
 - g. **[Universal Metal Hose]**
 - h. **<Insert manufacturer's name>**
 3. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - a. Working-Pressure Rating: **[200 psig (1380 kPa)][250 psig (1725 kPa)]** minimum.
 - b. End Connections: Plain-end copper tube.

2.3 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys.
- B. Threaded-Joint Tape: PTFE.

2.4 VALVES

- A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged in accordance with CGA G-4.1 for oxygen service.
- B. Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gauges.

1. Steel Zone-Valve Box with Aluminum Cover:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- 1) **[Amico Corporation]**
- 2) **[BeaconMedaes]**
- 3) **[CONCOA]**
- 4) **[Ohio Medical Corporation]**
- 5) **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
- 6) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Amico Corporation]**
- 2) **[BeaconMedaes]**
- 3) **[CONCOA]**
- 4) **[Ohio Medical Corporation]**
- 5) **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
- 6) **<Insert manufacturer's name>**

- c. Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gauges and in sizes required to permit manual operation of valves. **[Medical air tubing, valves, and gauges may be incorporated in zone valve boxes for medical gases.]**
- d. Interior Finish: Factory-applied white enamel.
- e. Cover Plate: Aluminum with frangible or removable windows.
- f. Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.

2. Steel Zone-Valve Box with Stainless Steel Cover:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering**

products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Amico Corporation]
- 2) [BeaconMedaes]
- 3) [Ohio Medical Corporation]
- 4) [Tri-Tech Medical]
- 5) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Amico Corporation]
- 2) [BeaconMedaes]
- 3) [Ohio Medical Corporation]
- 4) [Tri-Tech Medical]
- 5) <Insert manufacturer's name>

- c. Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gauges and in sizes required to permit manual operation of valves. [**Medical air and medical vacuum tubing, valves, and gauges may be incorporated in zone valve boxes for medical gases.**]
- d. Interior Finish: Factory-applied white enamel.
- e. Cover Plate: Stainless steel with frangible or removable windows.
- f. Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amico Corporation]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [BeaconMedaes]
 - d. [Bonomi North America, Inc.]
 - e. [Marwin Valve; Richards Industries]
 - f. [NIBCO INC.]
 - g. [Ohio Medical Corporation]
 - h. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - i. [Tri-Tech Medical]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amico Corporation]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [BeaconMedaes]
 - d. [Bonomi North America, Inc.]

- e. [Marwin Valve; Richards Industries]
 - f. [NIBCO INC.]
 - g. [Ohio Medical Corporation]
 - h. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - i. [Tri-Tech Medical]
 - j. <Insert manufacturer's name>
- 3. Standard: MSS SP-110.
 - 4. Description: Three-piece body, brass or bronze.
 - 5. Pressure Rating: **300 psig (2070 kPa)** minimum.
 - 6. Ball: Full-port, chrome-plated brass.
 - 7. Seats: PTFE or TFE.
 - 8. Handle: Lever[**type with locking device**].
 - 9. Stem: Blowout proof with PTFE or TFE seal.
 - 10. Ends: [Manufacturer-installed ASTM B819, copper-tube extensions][and][manufacturer-installed ASTM B819, copper-tube extensions with pressure gage on one copper-tube extension].

D. Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amico Corporation]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [BeaconMedaes]
 - d. [Bonomi North America, Inc.]
 - e. [Marwin Valve; Richards Industries]
 - f. [NIBCO INC.]
 - g. [Ohio Medical Corporation]
 - h. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - i. [Tri-Tech Medical]
 - j. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amico Corporation]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [BeaconMedaes]
 - d. [Bonomi North America, Inc.]
 - e. [Marwin Valve; Richards Industries]
 - f. [NIBCO INC.]
 - g. [Ohio Medical Corporation]
 - h. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - i. [Tri-Tech Medical]
 - j. <Insert manufacturer's name>
- 3. Description: In-line pattern, bronze.
- 4. Pressure Rating: **300 psig (2070 kPa)** minimum.
- 5. Operation: Spring loaded.

6. Ends: Manufacturer-installed, ASTM B819, copper-tube extensions.

E. Compressed-Air Safety Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amico Corporation]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Bonomi North America, Inc.]**
 - d. **[CEODEUX Meditec]**
 - e. **[UCSF Health Environment of Care]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amico Corporation]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Bonomi North America, Inc.]**
 - d. **[CEODEUX Meditec]**
 - e. **[UCSF Health Environment of Care]**
 - f. **<Insert manufacturer's name>**
3. Bronze body.
4. ASME-construction, poppet, pressure-relief type.
5. Settings to match system requirements.

F. Pressure Regulators:

1. Bronze body and trim.
2. Spring-loaded, diaphragm-operated, relieving type.
3. Manual pressure-setting adjustment.
4. Rated for **[250-psig (1725-kPa)]<Insert value>** minimum inlet pressure.
5. Capable of controlling delivered air pressure within **0.5 psig for each 10-psig (5.0 kPa for each 100-kPa)** inlet pressure.

2.5 MEDICAL COMPRESSED-AIR SERVICE CONNECTIONS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Amico Corporation]**
2. **[BeaconMedaes]**
3. **[Ohio Medical Corporation]**
4. **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
5. **[Tri-Tech Medical]**
6. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's Compressed-Air Piping For Laboratory And Healthcare**

name; product name or designation> or comparable product by one of the following:

1. **[Amico Corporation]**
2. **[BeaconMedaes]**
3. **[Ohio Medical Corporation]**
4. **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
5. **[Tri-Tech Medical]**
6. **<Insert manufacturer's name>**

C. General Requirements for Medical Compressed-Air Service Connections:

1. Suitable for specific medical air pressure and service listed.
2. Include roughing-in assemblies, finishing assemblies, and cover plates.
3. Recessed-type units made for concealed piping unless otherwise indicated.

D. Roughing-in Assembly:

1. Steel outlet box for recessed mounting and concealed piping.
2. Brass-body outlet block with secondary check valve that will prevent gas flow when primary valve is removed.
3. Double seals that will prevent air leakage.
4. ASTM B819, **NPS 3/8 (DN 10)** copper outlet tube brazed to valve with service marking and tube-end dust cap.

E. Finishing Assembly:

1. Brass housing with primary check valve.
2. Double seals that will prevent air leakage.
3. Cover plate with gas-service label.

F. Quick-Coupler Pressure Service Connections:

1. Outlets for **[medical air][and][instrument air]** with noninterchangeable keyed indexing to prevent interchange between services.
2. Constructed to permit one-handed connection and removal of equipment.
3. With positive-locking ring that retains equipment stem in valve during use.

G. D.I.S.S. Pressure Service Connections: Outlets, complying with CGA V-5, with threaded indexing to prevent interchange between services, constructed to permit one-handed connection and removal of equipment.

1. Medical Air: D.I.S.S. No. 1160.
2. Instrument Air: D.I.S.S. No. 1160.

H. Cover Plates:

1. One piece.
2. **[Aluminum][or][stainless steel]**.
3. Permanent, color-coded, identifying label matching corresponding service.

2.6 COMPRESSED-AIR MANIFOLDS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Amico Corporation]**
 2. **[BeaconMedaes]**
 3. **[Ohio Medical Corporation]**
 4. **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
 5. **[Tri-Tech Medical]**
 6. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Amico Corporation]**
 2. **[BeaconMedaes]**
 3. **[Ohio Medical Corporation]**
 4. **[Oxequip Health Industries; a division of Allied Healthcare Products Inc.]**
 5. **[Tri-Tech Medical]**
 6. **<Insert manufacturer's name>**
- C. Comply with NFPA 99, Ch. "Manifolds for Gas Cylinders without Reserve Supply."
- D. Comply with NFPA 55.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Central Control-Panel Unit:
1. Weatherproof cabinet.
 2. Supply and delivery pressure gages.
 3. Electrical alarm-system connections and transformer.
 4. Indicator lights or devices.
 5. Manifold connection.
 6. Pressure changeover switch.
 7. Line-pressure regulator.
 8. Shutoff valves.
 9. Safety valve.
- G. Manifold and Headers:
1. Duplex, nonferrous-metal header for number of cylinders indicated, divided into two equal banks.
 2. Designed for **2000-psig (13.8-MPa)** minimum inlet pressure.
 3. Cylinder-bank headers with inlet (pigtail) connections complying with CGA V-1.
 4. Individual inlet check valves, shutoff valve, pressure regulator, check valve, and pressure gauge.
- H. Operation: Automatic, pressure-switch-activated changeover from one cylinder bank to the other when first bank becomes exhausted, without line-pressure fluctuation or resetting of regulators and without supply interruption by shutoff of either cylinder-bank header.
- I. Mounting: **[Wall with mounting brackets for manifold control cabinet and headers][Floor with support legs for manifold control cabinet]**.

- J. Label manifold control unit with permanent label identifying compressed air and system operating pressure.
- K. Medical and Laboratory Air Manifolds: For **[four][eight]<Insert number>** cylinders and **[55-psig (380-kPa)]<Insert value>** line pressure.
- L. Instrument Air Manifolds: For **[eight][12]<Insert number>** cylinders and **[200-psig (1380-kPa)]<Insert value>** minimum line pressure.
- M. Compressed-Air Cylinders: **[Furnished by Owner][Number and type of compressed-air cylinders required for complete manifold systems]**.

2.7 COMPRESSED-AIR-CYLINDER STORAGE RACKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Airgas; an Air Liquide company]**
 - 2. **[RT Racking Systems]**
 - 3. **[USA Safety]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Airgas; an Air Liquide company]**
 - 2. **[RT Racking Systems]**
 - 3. **[USA Safety]**
 - 4. **<Insert manufacturer's name>**
- C. Wall Storage Racks: Fabricate racks with chain restraints for upright cylinders as indicated, or provide equivalent manufactured wall racks.
- D. Freestanding Storage Racks: Fabricate racks as indicated, or provide equivalent manufactured storage racks.
- E. Anchor holes in base to permit securing to the floor with anchor bolts supplied by the manufacturer.
- F. Rack Support Tubing: Minimum **2-inch by 2-inch by 1/8-inch (50-mm by 50-mm by 3-mm)** tube steel finished with baked-on exterior-grade polyurethane powder paint. All joints wrap-welded and polished.
- G. Restraints: Dual minimum **5/16-inch (8-mm)** steel welded link chain, electrically zinc-plated rated for **1,900 lb (860 kg)** with minimum **5/16-inch (8-mm)** zinc-plated carabineer hooks rated for **520 lb (235 kg)**.
- H. Comply with NFPA 55.
- I. Comply with NFPA 99.
- J. Comply with OSHPD #OPA-2878-10.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Air Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
1. Clean medical air tube and fittings, valves, gauges, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service in accordance with CGA G-4.1.
 2. Wash medical air tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of **1 lb (0.453 kg)** of chemical to **3 gal. (11.3 L)** of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 INSTALLATION OF PIPING

- A. General Location and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install seismic restraints on compressed-air piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- C. Comply with NFPA 99 for installation of compressed-air piping.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- G. Install piping adjacent to equipment and specialties to allow service and maintenance.
- H. Install piping with 1 percent slope downward in direction of flow.
- I. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.
- J. Install eccentric reducers, if available, where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- K. Install branch connections to mains from top of main. Provide drain leg at end of each main and branch at low points.
- L. Install piping to permit valve servicing.

- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and for branch connections.
- O. Install medical air piping to medical air service connections specified in this Section, to medical air service connections in equipment specified in Section 226313 "Gas Piping for Laboratory and Healthcare Facilities," and to equipment specified in other Sections requiring medical air service.
- P. Piping Restraint Installation: Install seismic restraints on compressed-air piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- Q. Install service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.
- R. Connect piping to air compressors and to compressed-air outlets and equipment requiring compressed-air service.
- S. Install unions in copper tubing adjacent to each valve and at final connection to each machine, specialty, and piece of equipment.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 INSTALLATION OF VALVES

- A. Install shutoff valve at each connection to and from compressed-air equipment and specialties.
- B. Install check valves to maintain correct direction of compressed-air flow from compressed-air equipment.
- C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.
- D. Install zone valves and gauges in valve boxes. Rotate valves to angle that prevents closure of cover when valve is in closed position.
- E. Install pressure regulators on compressed-air piping where reduced pressure is required.
- F. Install flexible pipe connectors in discharge piping[**and in inlet air piping from remote air-inlet filter**] of each air compressor.

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of cleaned tubing and fittings before assembly.

- C. Threaded Joints: Apply appropriate tape to external pipe threads.
- D. Brazed Joints: Join copper tube and fittings in accordance with CDA's "Copper Tube Handbook," Ch. "Brazed Joints." Do not use flux. Continuously purge joint with oil-free dry nitrogen during brazing.
- E. Soldered Joints: Apply ASTM B813, water-flushable flux to tube end. Join copper tube and fittings in accordance with ASTM B828.
- F. Extruded-Tee Outlets: Form branches in copper tube in accordance with ASTM F2014, with tools recommended by tube manufacturer.
- G. Flanged Joints:
 - 1. Copper Tubing: Install flange on copper tubes. Use pipe-flange gasket between flanges. Join flanges with gasket and bolts in accordance with ASME B31.9 for bolting procedure.
- H. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.

3.5 INSTALLATION OF COMPRESSED-AIR SERVICE COMPONENTS

- A. Install compressed-air pressure-control panel in walls. Attach to substrate.
- B. Install compressed-air manifolds[**on concrete base**] anchored to substrate.
- C. Install compressed-air cylinders and connect to manifold piping.
- D. Install compressed-air manifolds with seismic restraints as indicated.
- E. Install compressed-air-cylinder wall storage racks attached to substrate.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Vertical Piping: MSS Type 8 or Type 42 clamps.
- D. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel, clevis hangers.
 - 2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable, roller hangers.
- E. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.
- F. Base of Vertical Piping: MSS Type 52 spring hangers.

- G. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support horizontal piping within [**12 inches (300 mm)**]**<Insert dimension>** of each fitting and coupling.
- I. Support vertical runs of copper tubing to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 IDENTIFICATION

- A. Install identifying labels and devices for laboratory compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Install identifying labels and devices for medical compressed-air piping systems in accordance with NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 - 1. Medical Air: Black letters on yellow background.
 - 2. Dental Air: [**Black letters on yellow background**]**<Insert color code>**.
 - 3. Instrument Air: White letters on red background.
 - 4. Laboratory Air: Black letters on yellow-and-white checkerboard background.

3.8 FIELD QUALITY CONTROL FOR MEDICAL COMPRESSED-AIR PIPING IN HEALTHCARE FACILITIES

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].
- D. Tests and Inspections:
 - 1. Medical Compressed-Air Testing Coordination: Perform tests, inspections, verifications, and certification of medical compressed-air piping systems concurrently with tests, inspections, and certification of [**medical gas piping**][and][**medical vacuum piping**] systems.
 - 2. Preparation: Perform the following Installer tests in accordance with requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for positive-pressure medical compressed-air piping.
 - f. Repair leaks and retest until no leaks exist.

3. System Verification: Perform the following tests and inspections in accordance with NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:
 - a. Standing pressure test.
 - b. **[Individual-pressurization][or][pressure-differential]** cross-connection test.
 - c. Valve test.
 - d. Master and area alarm tests.
 - e. Piping purge test.
 - f. Piping particulate test.
 - g. Piping purity test.
 - h. Final tie-in test.
 - i. Operational pressure test.
 - j. Medical air-purity test.
 - k. Verify correct labeling of equipment and components.
4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed, and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.9 FIELD QUALITY CONTROL FOR COMPRESSED-AIR PIPING IN LABORATORY FACILITIES

- A. Testing Agency: **[Owner will engage][Engage]** qualified testing agency to perform tests and inspections of compressed-air piping in laboratory facilities and to prepare test and inspection reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]**.
- D. Tests and Inspections:
 1. Piping Leak Tests for Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill compressed-air piping with oil-free dry nitrogen to pressure of **50 psig (345 kPa)** above system operating pressure, but not less than **[150 psig (1035 kPa)]<Insert value>**. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 2. Repair leaks and retest until no leaks exist.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.10 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, in accordance with "Preparation" Article.

3.11 PIPING SCHEDULE

- A. Connect new tubing to existing tubing with memory-metal couplings.
- B. Flanges may be used where connection to flanged equipment is required.
- C. Type L Copper Tubing for Medical Air Piping Instrument Air Piping and Dental Air Piping, NPS 3 (DN 80) and Smaller, Operating between 15 psig (103 kPa) and 50 psig (345 kPa): Type L copper tubing, wrought copper fittings, and brazed joints.
- D. Type K Copper Tubing for Medical Air Piping Instrument Air Piping and Dental Air Piping, NPS 3 (DN 80) and Smaller, Operating between 15 psig (103 kPa) and 50 psig (345 kPa): Type K copper tubing, wrought copper fittings, and brazed joints.
- E. Type L Copper Tubing for Laboratory Air Piping, NPS 3 (DN 80) and Smaller, Operating between 15 psig (103 kPa) and 50 psig (345 kPa): Type L copper tubing, wrought copper fittings, and brazed joints.

3.12 VALVE SCHEDULE

- A. Shutoff Valves: Ball valve with manufacturer-installed ASTM B819, copper-tube extensions.
- B. Zone Valves: Ball valve with manufacturer-installed ASTM B819, copper-tube extensions with pressure gauge on one copper-tube extension.

END OF SECTION 22 11 16 00B

SECTION 22 11 16 00C - VACUUM PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Shape-memory-metal couplings.
3. Pressure-seal fittings.
4. Extruded-tee-outlets.
5. Flexible pipe connectors.
6. Joining materials.
7. Zone valve box assemblies.
8. Copper alloy ball valves
9. Check valves
10. Medical vacuum service connections.

B. Related Requirements:

1. Section 115313 "Laboratory Fume Hoods" for vacuum inlets in laboratory fume hoods.
2. Section 123553.13 "Metal Laboratory Casework" for vacuum inlets in laboratory casework.
3. Section 123553.16 "Plastic-Laminate-Clad Laboratory Casework" for compressed-air outlets in laboratory casework.
4. Section 123553.19 "Wood Laboratory Casework" for vacuum inlets in laboratory casework.
5. Section 123570 "Healthcare Casework" for vacuum inlets in healthcare casework.
6. Section 226219 "Vacuum Equipment for Laboratory and Healthcare Facilities" for vacuum producers and accessories.
7. Section 226400 "Medical Gas Alarms" for vacuum piping alarms.

1.2 DEFINITIONS

- A. HVE:** High-volume (oral) evacuation.
- B. WAGD:** Waste anesthetic gas disposal.
- C. Vacuum Piping Systems:** Include medical vacuum, WAGD, dental vacuum, HVE, and laboratory vacuum piping systems.
- D. Laboratory Vacuum Piping Systems:** Include laboratory low-vacuum and laboratory high-vacuum piping systems.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Sustainable Design Submittals:**
1. Product Data: For adhesives, indicating VOC content.



2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **[Installer][and][testing agency]**.
- B. Seismic Qualification Data: Certificates, for compressed-air manifolds, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Material Certificates: Signed by Installer, certifying that medical vacuum piping materials comply with requirements in NFPA 99 for medical vacuum systems.
- D. Brazing certificates.
- E. Field quality-control reports.
- F. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For vacuum piping specialties to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Quick-Coupler Service Connections: Furnish complete noninterchangeable medical vacuum suction inlets.
 - a. Medical Vacuum: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 - b. WAGD: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 2. D.I.S.S. Service Connections: Furnish complete medical vacuum suction inlets complying with CGA V-5.
 - a. Medical Vacuum D.I.S.S. No. 1220: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.
 - b. WAGD D.I.S.S. No. 2220: Equal to **<Insert number>** percent of amount installed, but no fewer than **<Insert number>** units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Medical Vacuum Piping Systems for Healthcare Facilities: In accordance with ASSE Standard #6010 **[and][NFPA 99]** for medical-gas-system installers.
2. Pressure-Seal Joining Procedure for Copper Tubing: An authorized representative who is trained and approved by manufacturer.
3. Extruded-Tee Outlet Procedure: An authorized representative who is trained and approved by manufacturer.
4. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer in accordance with ASSE Standard #6040 **[and][NFPA 99]**.

B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the vacuum piping testing indicated, that is **[a member of the Medical Gas Professional Healthcare Organization or is]** an NRTL, and that is acceptable to authorities having jurisdiction.

1. Qualify testing personnel in accordance with ASSE Standard #6020 **[and][NFPA 99]** for medical-gas-system inspectors and ASSE Standard #6030 **[and][NFPA 99]** for medical-gas-system verifiers.

C. Brazing: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications," or AWS B2.2/B2.2M.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Medical vacuum operating at **[15 in. Hg (380 mm Hg)][20 in. Hg (510 mm Hg)][30 in. Hg (760 mm Hg)]<Insert value>**.
- B. WAGD operating at **[14 in. Hg (355 mm Hg)][15 in. Hg (380 mm Hg)]<Insert value>**.
- C. Dental vacuum operating at **[10 in. Hg (255 mm Hg)][12 in. Hg (305 mm Hg)]<Insert value>**.
- D. HVE operating at **[5 in. Hg (125 mm Hg)][8 in. Hg (205 mm Hg)]<Insert value>**.
- E. Laboratory vacuum operating at **[12 in. Hg (305 mm Hg)][20 in. Hg (510 mm Hg)][24 in. Hg (610 mm Hg)][29 in. Hg (735 mm Hg)]<Insert value>**.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: **[Medical gas manifolds][and][bulk medical gas storage tanks]** shall withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**.
 1. The term "withstand" means "the **[medical gas manifolds][and][bulk medical gas storage tanks]** will remain in place without separation of any parts when subjected to the seismic forces specified **[and the manifolds and tanks will be fully operational after the seismic event].**"
 2. Component Importance Factor is **[1.5][1.0]**.
 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

- B. Comply with NFPA 99.

2.3 PIPES, TUBES, AND FITTINGS

- A. Comply with NFPA 99 for medical vacuum piping materials.
- B. Copper Medical Gas Tube: ASTM B819, Type L, seamless, drawn temper that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service. Include standard color marking "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue.
- C. Copper Water Tube: ASTM B88/ASTM B88M, Type M, seamless, drawn temper[**that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service**].
- D. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service.
- E. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.
- F. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.
 - 1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness, full-face type.
 - 2. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.
- G. Shape-Memory-Metal Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Aerofit, Inc]**
 - b. **[CAMERON; A Schlumber Co.]**
 - c. **[Motion Industries]**
 - d. **[Smart Tap; Smart Technology, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Aerofit, Inc]**
 - b. **[CAMERON; A Schlumber Co.]**
 - c. **[Motion Industries]**
 - d. **[Smart Tap; Smart Technology, Inc.]**
 - e. **<Insert manufacturer's name>**
 - 3. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy, and that has been manufacturer cleaned, purged, and sealed for oxygen service in accordance with CGA G-4.1.

H. Pressure-Seal Fittings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[FNW; Ferguson Enterprises, Inc.]**
 - b. **[NIBCO INC.]**
 - c. **[Viega LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[FNW; Ferguson Enterprises, Inc.]**
 - b. **[NIBCO INC.]**
 - c. **[Viega LLC]**
 - d. **<Insert manufacturer's name>**
3. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless steel grip ring and EPDM O-ring seal in each end.

I. Extruded-Tee Outlets: ASTM F2014 procedure for making branch outlets in copper tube.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[T-DRILL Industries Inc]**
 - b. **<Insert manufacturer's name>**

J. Flexible Pipe Connectors:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Flex-Hose Co., Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Hyspan Precision Products, Inc]**
 - d. **[Mercer Rubber Co]**
 - e. **[Metraflex Company (The)]**
 - f. **[Proco Products, Inc]**
 - g. **[Universal Metal Hose]**



- h. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Flex-Hose Co., Inc]
 - b. [Flexicraft Industries]
 - c. [Hyspan Precision Products, Inc]
 - d. [Mercer Rubber Co]
 - e. [Metraflex Company (The)]
 - f. [Proco Products, Inc]
 - g. [Universal Metal Hose]
 - h. <Insert manufacturer's name>
- 3. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - a. Working-Pressure Rating: [200 psig (1380 kPa)][250 psig (1725 kPa)] minimum.
 - b. End Connections: Plain-end copper tube.

2.4 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux in accordance with ASTM B813.
- B. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys.
- C. Threaded-Joint Tape: PTFE.

2.5 VALVES

- A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged in accordance with CGA G-4.1 for oxygen service.
 - 1. Exception: Factory cleaning and bagging are not required for valves for WAGD service.
- B. Zone Valve Box Assemblies: Box with medical gas valves, tube extensions, and gages.
 - 1. Zone Valve Boxes:
 - a. Steel Box with Aluminum Cover:
 - 1) Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a) [Allied Healthcare Products Inc.]
 - b) [Amico Corporation]
 - c) [Ohio Medical Corporation]
 - d) <Insert manufacturer's name>

- 2) Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a) **[Allied Healthcare Products Inc.]**
- b) **[Amico Corporation]**
- c) **[Ohio Medical Corporation]**
- d) **<Insert manufacturer's name>**

b. Steel Zone Valve Box with Stainless Steel Cover:

- 1) Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a) **[Amico Corporation]**
- b) **[BeaconMedaes]**
- c) **[Ohio Medical Corporation]**
- d) **[Tri-Tech Medical]**
- e) **<Insert manufacturer's name>**

- 2) Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a) **[Amico Corporation]**
- b) **[BeaconMedaes]**
- c) **[Ohio Medical Corporation]**
- d) **[Tri-Tech Medical]**
- e) **<Insert manufacturer's name>**

- c. Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gages and in sizes required to permit manual operation of valves. **[Medical air and medical vacuum tubing, valves, and gages may be incorporated in zone valve boxes for medical gases.]**

- 1) Interior Finish: Factory-applied white enamel.
- 2) Cover Plate: **[Aluminum][or][stainless steel]** with frangible or removable windows.
- 3) Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.

C. Copper-Alloy Ball Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. **[Allied Healthcare Products Inc.]**
- b. **[Amico Corporation]**
- c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
- d. **[BeaconMedaes]**
- e. **[Marwin Valve; Richards Industries]**
- f. **[NIBCO INC.]**

- g. [Ohio Medical Corporation]
- h. [Tri-Tech Medical]
- i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Allied Healthcare Products Inc.]
- b. [Amico Corporation]
- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- d. [BeaconMedaes]
- e. [Marwin Valve; Richards Industries]
- f. [NIBCO INC.]
- g. [Ohio Medical Corporation]
- h. [Tri-Tech Medical]
- i. <Insert manufacturer's name>

- 3. Standard: MSS SP-110.
- 4. Description: Three-piece body, brass or bronze.
- 5. Pressure Rating: **300 psig (2070 kPa)** minimum.
- 6. Ball: Full-port, chrome-plated brass.
- 7. Seats: PTFE or TFE.
- 8. Handle: Lever[**type with locking device**].
- 9. Stem: Blowout proof with PTFE or TFE seal.
- 10. Ends: [Manufacturer-installed ASTM B819, copper-tube extensions][and][manufacturer-installed ASTM B819, copper-tube extensions with pressure gauge on one copper-tube extension].

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Allied Healthcare Products Inc.]
- b. [Amico Corporation]
- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- d. [BeaconMedaes]
- e. [Marwin Valve; Richards Industries]
- f. [NIBCO INC.]
- g. [Ohio Medical Corporation]
- h. [Tri-Tech Medical]
- i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Allied Healthcare Products Inc.]
- b. [Amico Corporation]
- c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- d. [BeaconMedaes]
- e. [Marwin Valve; Richards Industries]

- f. [NIBCO INC.]
 - g. [Ohio Medical Corporation]
 - h. [Tri-Tech Medical]
 - i. <Insert manufacturer's name>
- 3. Description: In-line pattern, bronze.
 - 4. Pressure Rating: **300 psig (2070 kPa)** minimum.
 - 5. Operation: Spring loaded.
 - 6. Ends: Manufacturer-installed ASTM B819, copper-tube extensions.

2.6 MEDICAL VACUUM SERVICE CONNECTIONS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. [Allied Healthcare Products Inc.]
 - 2. [Amico Corporation]
 - 3. [BeaconMedaes]
 - 4. [Ohio Medical Corporation]
 - 5. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - 6. [Tri-Tech Medical]
 - 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. [Allied Healthcare Products Inc.]
 - 2. [Amico Corporation]
 - 3. [BeaconMedaes]
 - 4. [Ohio Medical Corporation]
 - 5. [Oxequip Health Industries; a division of Allied Healthcare Products Inc.]
 - 6. [Tri-Tech Medical]
 - 7. <Insert manufacturer's name>
- C. General Requirements for Medical Vacuum Service Connections:
 - 1. Suitable for specific medical vacuum service listed.
 - 2. Include roughing-in assemblies, finishing assemblies, and cover plates.
 - 3. Individual cover plates are not required if service connection is in multiple units or assembly with cover plate.
 - 4. Recessed-type units made for concealed piping unless otherwise indicated.
- D. Roughing-in Assembly:
 - 1. Steel outlet box for recessed mounting and concealed piping.
 - 2. Brass-body inlet block.
 - 3. Seals that will prevent vacuum leakage.
 - 4. ASTM B819, **NPS 3/8 (DN 10)** copper outlet tube brazed to valve with service marking and tube-end dust cap.
- E. Finishing Assembly:
 - 1. Brass housing with primary check valve.
 - 2. Seals that will prevent vacuum leakage.

3. Cover plate with gas-service label.

F. Quick-Coupler Suction Service Connections:

1. Inlets for **[medical vacuum][and][WAGD]** with noninterchangeable keyed indexing to prevent interchange between services.
2. Constructed to permit one-handed connection and removal of equipment.
3. With positive-locking ring that retains equipment stem in valve during use.

G. D.I.S.S. Suction Service Connections:

1. Inlets complying with CGA V-5.
2. Threaded indexing to prevent interchange between services.
3. Constructed to permit one-handed connection and removal of equipment.
4. Medical Vacuum: CGA V-5, D.I.S.S. No. 1220.
5. WAGD: CGA V-5, D.I.S.S. No. 2220.

H. Vacuum Bottle Brackets: One piece, with pattern and finish matching corresponding service cover plate.

I. Cover Plates:

1. One piece.
2. **[Aluminum][or][stainless steel]**.
3. Permanent, color-coded, identifying label matching corresponding service.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Vacuum Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
1. Clean medical vacuum tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service in accordance with CGA G-4.1.
 2. Wash medical vacuum tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of **1 lb (0.453 kg)** of chemical to **3 gal. (11.3 L)** of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 INSTALLATION OF PIPING

- A. General Location and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of vacuum piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, vacuum producer sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Comply with NFPA 99 for installation of vacuum piping.

- C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install piping with 1 percent slope downward in direction of flow.
- H. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than piping pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.
- I. Install eccentric reducers, if available, where vacuum piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- J. Provide drain leg and drain trap at end of each main and branch and at low points.
- K. Install piping to permit valve servicing.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and for branch connections. Extruded-tee branch outlets in copper tubing may be made where specified.
- N. Install medical vacuum piping from medical vacuum service connections specified in this Section, to equipment specified in Section 226219 "Vacuum Equipment for Laboratory and Healthcare Facilities," and to equipment specified in other Sections requiring medical vacuum service.
- O. Piping Restraint Installation: Install seismic restraints on vacuum piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- P. Install vacuum service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.
- Q. Install vacuum bottle bracket adjacent to each wall-mounted medical vacuum service connection suction inlet.
- R. Connect vacuum piping to vacuum producers and to equipment requiring vacuum service.
- S. Install unions in copper vacuum tubing adjacent to each valve and at final connection to each machine, specialty, and piece of equipment.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 INSTALLATION OF VALVES

- A. Install shutoff valve at each connection to and from vacuum equipment and specialties.
- B. Install check valves to maintain correct direction of vacuum flow to vacuum-producing equipment.
- C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.
- D. Install zone valves and gages in valve boxes. Rotate valves to angle that prevents closure of cover when valve is in closed position.
- E. Install flexible pipe connectors in suction inlet piping to each vacuum producer.

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Apply appropriate tape to external pipe threads.
- D. Brazed Joints: Join copper tube and fittings in accordance with CDA's "Copper Tube Handbook," Ch. "Brazed Joints." Do not use flux. Continuously purge joint with oil-free dry nitrogen during brazing.
- E. Soldered Joints: Apply ASTM B813, water-flushable flux to tube end. Join copper tube and fittings in accordance with ASTM B828.
- F. Extruded-Tee Outlets: Form branches in copper tube in accordance with ASTM F2014, with tools recommended by tube manufacturer.
- G. Flanged Joints:
 - 1. Copper Tubing: Install flange on copper tubes. Use pipe-flange gasket between flanges. Join flanges with gasket and bolts in accordance with ASME B31.9 for bolting procedure.
- H. Pressure-Sealed Joints: Join copper tube and copper and copper-alloy fittings with tools recommended by fitting manufacturer.
- I. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Vertical Piping: MSS Type 8 or Type 42, clamps.

- D. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel, clevis hangers.
 - 2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable, roller hangers.
- E. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.
- F. Base of Vertical Piping: MSS Type 52 spring hangers.
- G. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support horizontal piping within **[12 inches (300 mm)]<Insert dimension>** of each fitting and coupling.
- I. Support vertical runs of copper tubing to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 IDENTIFICATION

- A. Install identifying labels and devices for laboratory vacuum piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Install identifying labels and devices for medical vacuum piping systems in accordance with NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 - 1. Medical Vacuum: Black letters on white background.
 - 2. WAGD: White letters on violet background.
 - 3. Dental Vacuum: **[Black boxed letters on white-and-black diagonal stripe background]<Insert color code>**.
 - 4. HVE: **[Black boxed letters on white-and-black diagonal stripe background]<Insert color code>**.
 - 5. Laboratory Vacuum: Black boxed letters on white-and-black checkerboard background.

3.7 FIELD QUALITY CONTROL FOR HEALTHCARE FACILITY MEDICAL VACUUM PIPING

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]**.
- D. Tests and Inspections:
 - 1. Medical Vacuum Testing Coordination: Perform tests, inspections, verifications, and certification of medical vacuum piping systems concurrently with tests, inspections, and certification of **[medical compressed-air piping][and][medical gas piping]** systems.

2. Preparation: Perform the following Installer tests in accordance with requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for vacuum systems.
 - f. Repair leaks and retest until no leaks exist.
3. System Verification: Perform the following tests and inspections in accordance with NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:
 - a. Standing pressure test.
 - b. **[Individual-pressurization][or][pressure-differential]** cross-connection test.
 - c. Valve test.
 - d. Master and area alarm tests.
 - e. Piping purge test.
 - f. Final tie-in test.
 - g. Operational vacuum test.
 - h. Verify correct labeling of equipment and components.
4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed, and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.

E. Piping will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.8 FIELD QUALITY CONTROL FOR LABORATORY FACILITY VACUUM PIPING

- A. Testing Agency: **[Owner will engage][Engage]** qualified testing agency to perform tests and inspections of vacuum piping in laboratory facilities and to prepare test and inspection reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections **[with the assistance of a factory-authorized service representative]**.
- D. Tests and Inspections:
 1. Piping Leak Tests for Vacuum Piping: Test new and modified parts of existing piping. Cap and fill vacuum piping with oil-free, dry nitrogen. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - a. Test Pressure for Copper Tubing: **[100 psig (690 kPa)][150 psig (1035 kPa)]<Insert value>**.

2. Repair leaks and retest until no leaks exist.
3. Inspect filters for proper operation.

- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.9 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, in accordance with "Preparation" Article.

3.10 PIPING SCHEDULE

- A. Connect new copper tubing to existing copper tubing with memory-metal couplings.
- B. Connect PVC pipe to copper tube with transition fittings.
- C. Flanges may be used where connection to flanged equipment is required.
- D. WAGD Piping: Use copper **[medical gas][water]** tube, wrought-copper fittings, and brazed joints.
- E. Dental Vacuum Piping: Use copper water tube, wrought-copper fittings, and **[brazed][soldered]** joints.
- F. HVE Piping: Use **[one of]** the following piping materials for each size range:
1. NPS 4 (DN 100) and Smaller, Wrought-Copper Fittings: Copper **[medical gas][water]** tube, wrought-copper fittings, and **[brazed][soldered]** joints.
 2. NPS 4 (DN 100) and Smaller, Press-Type Fittings: Copper **[medical gas][water]** tube, press-type fittings, and pressure-sealed joints.
 3. Wrought-Copper Fittings: **[NPS 5 to NPS 8 (DN 125 to DN 200)]<Insert range>, [Type L, copper medical gas][Type M (C), copper water]** tube; wrought-copper fittings; and **[brazed][soldered]** joints.
- G. Medical Vacuum Piping: Use **[one of]** the following piping materials for each size range:
1. NPS 4 (DN 100) and Smaller, Wrought-Copper Fittings: Copper **[medical gas][water]** tube, wrought-copper fittings, and **[brazed][soldered]** joints.
 2. NPS 4 (DN 100) and Smaller, Press-Type Fittings: Copper **[medical gas][water]** tube, press-type fittings, and pressure-sealed joints.
 3. Wrought-Copper Fittings: **[NPS 5 to NPS 8 (DN 125 to DN 200)]<Insert range>, copper [medical gas][water]** tube, wrought-copper fittings, and **[brazed][soldered]** joints.
- H. Laboratory Vacuum Piping: Use **[one of]** the following piping materials for each size range:
1. NPS 4 (DN 100) and Smaller, Wrought-Copper Fittings: Copper **[medical gas][water]** tube, wrought-copper fittings, and **[brazed][soldered]** joints.
 2. NPS 4 (DN 100) and Smaller, Press-Type Fittings: Copper **[medical gas][water]** tube, press-type fittings, and pressure-sealed joints.



3. NPS 5 to NPS 8 (DN 125 to DN 200) <Insert range>, Wrought-Copper Fittings: Copper [medical gas][water] tube, wrought-copper fittings, and [brazed][soldered] joints.
4. All Sizes: Extruded-tee fittings and brazed joints may be used instead of standard tee fittings.

3.11 VALVE SCHEDULE

A. Shutoff Valves:

1. Copper Tubing: Copper-alloy ball valve with manufacturer-installed ASTM B819, copper-tube extensions.

B. Zone Valves: Copper-alloy ball valve with manufacturer-installed ASTM B819, copper-tube extensions with pressure gage on one copper-tube extension.

END OF SECTION 22 11 16 00C

SECTION 22 11 16 00D - STEAM AND CONDENSATE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and fittings.
2. Stainless steel pipe and fittings.
3. Fiberglass pipe and fittings.
4. Joining materials.

B. Related Requirements:

1. Section 232216 "Steam and Condensate Heating Piping Specialties" for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show steam and steam condensate piping layouts, sizes, elevations, and piping slopes, including connecting equipment, valves, special-duty valves, fittings, strainers, air vents and vacuum breakers, flash tanks, steam pressure reducing valves, steam traps, steam meters, steam condensate meters, and expansion loops/expansion joints/anchors.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: [1/4 inch equals 1 foot (1:50)]<Insert value>.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
3. Environmental Product Declaration (EPD): For each product.
4. Health Product Declaration (HPD): For each product.
5. Environmental Product Declaration (EPD): For each product.
6. Health Product Declaration (HPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Environmental Product Declaration (EPD): For each product.
9. Environmental Product Declaration (EPD): For each product.
10. Third-Party Certifications: For each product.
11. Third-Party-Certified Life-Cycle Assessment: For each product.

D. Delegated Design Submittals:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the

- same to the building structure.
- 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
- 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
- 4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Other building services.
 - 3. Structural members.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Field quality control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Fiberglass Pipe and Fitting Installers: Installers of fiberglass pipe and fittings to be certified by the manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.
- B. Steel Support Welding: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding: Qualify procedures and operators in accordance with the following:
 - 1. ASME Compliance: Comply with [ASME B31.1, "Power Piping,"][and][ASME B31.9, "Building Services Piping,"] for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation to be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
 - 1. HP Steam Piping: <Insert psig (kPa)>.
 - 2. LP Steam Piping: <Insert psig (kPa)>.
 - 3. LP Clean Steam Piping: <Insert psig (kPa)>.

4. Condensate Piping: <Insert psig (kPa)> at [250 deg F (121 deg C)]<Insert temperature>.
5. Clean Steam Condensate Piping: <Insert psig (kPa)> at [250 deg F (121 deg C)]<Insert temperature>.
6. Makeup-Water Piping: [80 psig (552 kPa)][150 psig (1034 kPa)]<Insert value> at [150 deg F (66 deg C)]<Insert temperature>.
7. Blowdown-Drain Piping: Equal to pressure of the piping system to which it is attached.
8. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
9. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A53/A53M, black steel, plain ends, welded and seamless, Grade B, and Schedule as indicated in piping applications articles.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in piping applications articles.
- C. Malleable-Iron Threaded Fittings: ASME B16.3; Classes 150 and 300 as indicated in piping applications articles.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in piping applications articles.
- E. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in piping applications articles; raised ground face, and bolt holes spot faced.
- F. Wrought-Steel Fittings: ASTM A234/A234M, wall thickness to match adjoining pipe.
- G. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. End Connections: Butt welding.
 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

2.3 STAINLESS STEEL PIPE AND FITTINGS

- A. Stainless Steel Pipe: ASTM A312/A312M, plain ends, seamless; stainless steel of types and schedules as indicated in piping application articles.
- B. Stainless Steel Socket Weld Fittings: Stainless steel, wrought or forged, of types and classes as indicated in piping application articles.
- C. Stainless Steel Flanges and Flanged Fittings: ASME B16.5, Class 150, wrought, raised face weld neck, including gaskets, bolts, and nuts of material to match pipe.

2.4 FIBERGLASS PIPE AND FITTINGS

- A. Reinforced Thermosetting Resin Pressure Pipe (RTRP): ASTM D2996, Type 1, Grade 1, Class F, filament-wound pipe with tapered bell and spigot ends for adhesive joints.
- B. Glass-Fiber-Reinforced Thermosetting-Resin: ASTM D5685, Type 2 or Type 5, Grade 1, Class F, compression or spray-up/contact molded fittings of same material, pressure class, and joining method as pipe.
- C. Flanges: ASTM D4024, Type 1, Grade 1, full-face gaskets suitable for the service, minimum **1/8 inch (3.2 mm)** thick, 60-70 durometer. ASTM A307, Grade B, hex head bolts with washers.

2.5 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, **1/8-inch (3.2-mm)** maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face flanges.
 - b. Narrow-Face Type: For raised-face flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel of type to match pipe unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- D. Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.
- E. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.
 - 1. Verify fiberglass adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 4. Verify adhesive complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

- A. LP Steam Piping, **[NPS 2 (DN 50) and Smaller]**<Insert pipe size range>: **[Schedule 40][Schedule 80]**, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
- B. LP Steam Piping, **[NPS 2-1/2 through NPS 12 (DN 65 through DN 300)]**<Insert pipe size range>: **[Schedule 40][Schedule 80]**, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- C. LP Steam Piping, **[NPS 14 through NPS 18 (DN 350 through DN 450)]**<Insert pipe size range>: Schedule 30, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- D. LP Steam Piping, **[NPS 20 (DN 500) and Larger]**<Insert pipe size range>: Schedule 20, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- E. Condensate piping above grade, **[NPS 2 (DN 50)]**<Insert pipe size range> and smaller, to be **[either of]** the following:
 - 1. Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
 - 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- F. Condensate piping above grade, **[NPS 2-1/2 (DN 65)]**<Insert pipe size range> and larger, to be **[either of]** the following:
 - 1. Schedule 80, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
 - 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- G. Condensate piping below grade, **[NPS 2 (DN 50)]**<Insert pipe size range> and smaller, to be **[either of]** the following:
 - 1. Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
 - 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- H. Condensate piping below grade, **[NPS 2-1/2 (DN 65)]**<Insert pipe size range> and larger, to be **[either of]** the following:
 - 1. Schedule 80, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
 - 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- I. LP Clean Steam Piping:
 - 1. LP clean steam piping above grade, **[NPS 2 (DN 50)]**<Insert pipe size range> and smaller, to be the following:
 - a. **[Schedule 40][Schedule 80]**, **[Type 304][Type 316]** stainless steel pipe; **[wrought][or][forged]**, **[Class 2000][Class 3000]**<Insert class>, same type stainless steel socket weld fittings.

2. LP clean steam piping above grade, **[NPS 2-1/2 (DN 65)]<Insert pipe size range>** and larger, to be the following:

- a. **[Schedule 40][Schedule 80], [Type 304][Type 316]** stainless steel pipe; same type stainless steel flanges and wrought stainless steel flanged fittings.

J. Clean Steam Condensate Piping:

1. Clean steam condensate piping above grade, **[NPS 2 (DN 50)]<Insert pipe size range>** and smaller, to be the following:

- a. **[Schedule 40][Schedule 80], [Type 304][Type 316]** stainless steel pipe; **[wrought][or][forged][Class 2000][Class 3000]<Insert class>** same type stainless steel socket weld fittings.

2. Clean steam condensate piping above grade, **[NPS 2-1/2 (DN 65)]<Insert pipe size range>** and larger, to be the following:

- a. **[Schedule 40][Schedule 80], [Type 304][Type 316]** stainless steel pipe; same type stainless steel flanges and wrought stainless steel flanged fittings.

3.2 HP STEAM PIPING APPLICATIONS

- A. HP Steam Piping, **[NPS 2 (DN 50) and Smaller]<Insert pipe size range>**: **[Schedule 40][Schedule 80]**, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
- B. HP Steam Piping, **[NPS 2-1/2 through NPS 12 (DN 65 through DN 300)]<Insert pipe size range>**: **[Schedule 40][Schedule 80]**, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- C. HP Steam Piping, **[NPS 14 through NPS 18 (DN 350 through DN 450)]<Insert pipe size range>**: Schedule 30, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- D. HP Steam Piping, **[NPS 20 (DN 500) and Larger]<Insert pipe size range>**: Schedule 20, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
- E. Condensate piping above grade, **[NPS 2 (DN 50)]<Insert pipe size range>** and smaller, to be **[either of]** the following:
 1. Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- F. Condensate piping above grade, **[NPS 2-1/2 (DN 65)]<Insert pipe size range>** and larger, to be **[either of]** the following:
 1. Schedule 80, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
 2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.
- G. Condensate piping below grade, **[NPS 2 (DN 50)]<Insert pipe size range>** and smaller, to be **[either of]** the following:

1. Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.

H. Condensate piping below grade, **[NPS 2-1/2 (DN 65)]<Insert pipe size range>** and larger, to be **[either of]** the following:

1. Schedule 80, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.
2. RTRP and Glass-Fiber-Reinforced Thermosetting-Resin pipe with adhesive or flanged joints.

3.3 ANCILLARY PIPING APPLICATIONS

- A. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- B. Vacuum-Breaker Piping: Outlet, same as service where installed.
- C. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.4 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless otherwise indicated.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Install piping to allow application of insulation.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- K. Install drains, consisting of a tee fitting, **NPS 3/4 (DN 20)** full port-ball valve, and short **NPS 3/4 (DN 20)** threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- L. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.

- M. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.
 - N. Reduce pipe sizes using eccentric reducer fitting installed with level side down.
 - O. Install branch connections to mains using[**mechanically formed**] tee fittings in main pipe, with the branch connected to top of main pipe.
 - P. Install valves in accordance with Section 230523 "General-Duty Valves for HVAC Piping" or other Sections as needed.
 - Q. Install unions in piping, [**NPS 2 (DN 50)]<Insert pipe size>** and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
 - R. Install flanges in piping, [**NPS 2-1/2 (DN 65)]<Insert pipe size>** and larger, at final connections of equipment and elsewhere as indicated.
 - S. Install shutoff valve immediately upstream of each dielectric fitting.
 - T. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install **NPS 3/4 (DN 20)** nipple and full port ball valve in blowdown connection of strainers **NPS 2 (DN 50)** and larger. Match size of strainer blowoff connection for strainers smaller than **NPS 2 (DN 50)**.
 - U. Comply with requirements in Section 230500 "Common Work Results for HVAC" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
 - V. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
 - W. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.
 - 1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding [**300 ft. (90 m)]<Insert distance>**.
 - 2. Size drip legs same size as main. In steam mains **NPS 6 (DN 150)** and larger, drip leg size can be reduced, but to no less than **NPS 4 (DN 100)**.
 - X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."
 - Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230500 "Common Work Results for HVAC."
 - Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."
- 3.5 INSTALLATION OF STEAM AND CONDENSATE PIPING SPECIALTIES
- A. Comply with requirements in Section 232216 "Steam and Condensate Heating Piping Specialties" for installation requirements for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for installation of hangers, supports, and anchor devices.
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than **20 ft. (6 m)** long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping **20 ft. (6 m)** or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping **20 ft. (6 m)** or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
- D. Install hangers for steel steam supply piping and steel steam condensate piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Install hangers for fiberglass piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support horizontal piping within [**12 inches (300 mm)**]**<Insert dimension>** of each fitting.
- G. Support vertical runs of steel steam supply piping and steel steam condensate piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support vertical runs of fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12, using qualified processes and welding operators in accordance with "Quality Assurance" Article.
- E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- F. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join in accordance with pipe manufacturer's written instructions.

3.8 TERMINAL EQUIPMENT CONNECTIONS

- A. Size for supply and return piping connections to be the same as or larger than equipment connections.
- B. Install traps and control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install vacuum breakers downstream from control valve, close to coil inlet connection.
- E. Install a drip leg at coil outlet.

3.9 FIELD QUALITY CONTROL

- A. Prepare steam and condensate piping in accordance with **[ASME B31.1, "Power Piping,"]****[and]****[ASME B31.9, "Building Services Piping,"]** and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush system with clean water. Clean strainers.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure to be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
- B. Testing Agency: **[Owner will engage]****[Engage]** a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure will not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
 - 3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
- E. Prepare test and inspection reports.

END OF SECTION 22 11 16 00D



Task	Specification	Specification Description
22 11 16 00	21 05 00 00	Common Work Results for Fire Suppression
22 11 16 00	22 05 00 00	Common Work Results for Plumbing
22 11 16 00	22 11 00 00	Gray-Water Piping
22 11 16 00	22 13 16 00	Sanitary Waste And Vent Piping
22 11 16 00	22 15 13 00	General-Service Compressed-Air Piping
22 11 16 00	22 63 13 00	Gas Piping For Laboratory And Healthcare Facilities
22 11 16 00	23 05 00 00	Common Work Results for HVAC
22 11 16 00	23 21 13 00	Hydronic Piping
22 11 16 00	23 23 00 00	Refrigerant Piping



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SECTION 22 11 19 00 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Automatic water shutoff valve systems.
5. Balancing valves.
6. Temperature-actuated, water mixing valves.
7. Strainers for domestic water piping.
8. Outlet boxes.
9. Hose stations.
10. Hose bibbs.
11. Wall hydrants.
12. Ground hydrants.
13. Post hydrants.
14. Roof hydrants.
15. Drain valves.
16. Water-hammer arresters.
17. Trap-seal primer device.
18. Trap-seal primer systems.
19. Flexible connectors.
20. Water meters.

B. Related Requirements:

1. Section 220500 "Common Work Results for Plumbing."
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 223200 "Domestic Water Filtration Equipment" for water filters in domestic water piping.
4. Section 224300 "Healthcare Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.
5. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
6. Section 224700 "Drinking Fountains and Water Coolers."
7. Section 230923.18 "Leak Detection Instruments" for leak detection devices related to HVAC applications.
8. Section 331415 "Site Water Distribution Piping" for fire water-service backflow prevention devices.

1.2 DEFINITIONS

- A.** AMI: Advanced Metering Infrastructure.
- B.** AMR: Automatic Meter Reading.
- C.** FKM: A family of fluoroelastomer materials defined by ASTM D1418.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Test and inspection reports.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: **[125 psig (860 kPa)]<Insert value>** unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Cash Acme Plumbing Products; an RWC brand]**
 - c. **[FEBCO; A WATTS Brand]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**

- f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Cash Acme Plumbing Products; an RWC brand]
 - c. [FEBCO; A WATTS Brand]
 - d. [WATTS; A Watts Water Technologies Company]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
3. Standard: ASSE 1001.
4. Size: **NPS 1/4 to NPS 3 (DN 8 to DN 80)**, as required to match connected piping.
5. Body: Bronze.
6. Inlet and Outlet Connections: Threaded.
7. Finish: [**Rough bronze**][**Chrome plated**].
- B. Hose-Connection Vacuum Breakers:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Cash Acme Plumbing Products; an RWC brand]
 - c. [Champion-Arrowhead]
 - d. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - e. [MIFAB, Inc]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Cash Acme Plumbing Products; an RWC brand]
 - c. [Champion-Arrowhead]
 - d. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - e. [MIFAB, Inc]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
 3. Standard: ASSE 1011.
 4. Body: Bronze, nonremovable, with manual drain.
 5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 6. Finish: [**Chrome or nickel plated**][**Rough bronze**].
- C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[FEBCO; A WATTS Brand]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[FEBCO; A WATTS Brand]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
3. Standard: ASSE 1020.
4. Operation: Continuous-pressure applications.
5. Pressure Loss: **[5 psig (35 kPa)]<Insert value>** maximum, through middle third of flow range.
6. Size: **<Insert NPS (DN)>**.
7. Design Flow Rate: **<Insert gpm (L/s)>**.
8. Selected Unit Flow Range Limits: **<Insert gpm (L/s)>**.
9. Pressure Loss at Design Flow Rate: **<Insert psig (kPa)>**.
10. Accessories:
 - a. Valves: Ball type, on inlet and outlet.

D. Laboratory-Faucet Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
3. Standard: ASSE 1035.
4. Size: **NPS 1/4 or NPS 3/8 (DN 8 or DN 10)** matching faucet size.

5. Body: Bronze.
6. End Connections: Threaded.
7. Finish: Chrome plated.

E. Spill-Resistant Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
3. Standard: ASSE 1056.
4. Operation: Continuous-pressure applications.
5. Size: **[NPS 3/8 (DN 10)][NPS 1/2 (DN 15)][NPS 3/4 (DN 20)][NPS 1 (DN 25)]**.
6. Accessories:
 - a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Caleffi North America]**
 - c. **[Cash Acme Plumbing Products; an RWC brand]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[Caleffi North America]**
 - c. **[Cash Acme Plumbing Products; an RWC brand]**

- d. **[WATTS; A Watts Water Technologies Company]**
- e. **[Zurn Industries, LLC]**
- f. **<Insert manufacturer's name>**

- 3. Standard: ASSE 1012.
- 4. Operation: Continuous-pressure applications.
- 5. Size: **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)]**.
- 6. Body: Bronze.
- 7. End Connections: **[Union, solder][Solder]** joint.
- 8. Finish: **[Rough bronze]<Insert finish>**.

B. Reduced-Pressure-Principle Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Caleffi North America]**
 - d. **[FEBCO; A WATTS Brand]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Caleffi North America]**
 - d. **[FEBCO; A WATTS Brand]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
- 3. Standard: ASSE 1013.
- 4. Operation: Continuous-pressure applications.
- 5. Pressure Loss: **[12 psig (83 kPa)]<Insert value>** maximum, through middle third of flow range.
- 6. Size: **<Insert NPS (DN)>**.
- 7. Design Flow Rate: **<Insert gpm (L/s)>**.
- 8. Selected Unit Flow Range Limits: **<Insert gpm (L/s)>**.
- 9. Pressure Loss at Design Flow Rate: **<Insert psig (kPa)>** for sizes **NPS 2 (DN 50)** and smaller; **<Insert psig (kPa)>** for **NPS 2-1/2 (DN 65)** and larger.
- 10. Body: **[Bronze][cast silicon copper alloy][or][stainless steel]** for **NPS 2 (DN 50)** and smaller; **[ductile or cast iron with interior lining that complies with AWWA C550 or that is FDA approved][or][stainless steel]** for **NPS 2-1/2 (DN 65)** and larger.
- 11. End Connections: Threaded for **NPS 2 (DN 50)** and smaller; **[flanged]<Insert type>** for **NPS 2-1/2 (DN 65)** and larger.
- 12. Configuration: Designed for **[horizontal, straight-through][vertical-inlet, horizontal-center-section, and vertical-outlet][vertical]<Insert configuration>** flow.
- 13. Accessories:

- a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
- b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[FEBCO; A WATTS Brand]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ames Fire & Waterworks; A Watts Water Technologies Company]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[FEBCO; A WATTS Brand]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
- 3. Standard: ASSE 1015.
- 4. Operation: Continuous-pressure applications unless otherwise indicated.
- 5. Pressure Loss: **[5 psig (35 kPa)]<Insert value>** maximum, through middle third of flow range.
- 6. Size: **<Insert NPS (DN)>**.
- 7. Design Flow Rate: **<Insert gpm (L/s)>**.
- 8. Selected Unit Flow Range Limits: **<Insert gpm (L/s)>**.
- 9. Pressure Loss at Design Flow Rate: **<Insert psig (kPa)>** for sizes **NPS 2 (DN 50)** and smaller; **<Insert psig (kPa)>** for **NPS 2-1/2 (DN 65)** and larger.
- 10. Body: **[Bronze][cast silicon copper alloy][or][stainless steel]** for **NPS 2 (DN 50)** and smaller; **[ductile or cast iron with interior lining that complies with AWWA C550 or that is FDA approved][or][stainless steel]** for **NPS 2-1/2 (DN 65)** and larger.
- 11. End Connections: Threaded for **NPS 2 (DN 50)** and smaller; **[flanged]<Insert type>** for **NPS 2-1/2 (DN 65)** and larger.
- 12. Configuration: Designed for **[horizontal, straight-through]<Insert configuration>** flow.
- 13. Accessories:
 - a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

D. Beverage-Dispensing-Equipment Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [WATTS; A Watts Water Technologies Company]
 - c. [Zurn Industries, LLC]
 - d. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [WATTS; A Watts Water Technologies Company]
 - c. [Zurn Industries, LLC]
 - d. <Insert manufacturer's name>
3. Standard: ASSE 1022.
 4. Operation: Continuous-pressure applications.
 5. Size: NPS 1/4 or NPS 3/8 (DN 8 or DN 10).
 6. Body: [Stainless steel or non-metallic]<Insert material>.
 7. End Connections: Threaded or flare.

E. Dual-Check-Valve Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cash Acme Plumbing Products; an RWC brand]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Zurn Industries, LLC]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [Cash Acme Plumbing Products; an RWC brand]
 - d. [Flomatic Valves; Flomatic Corporation]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Zurn Industries, LLC]
 - g. <Insert manufacturer's name>
3. Standard: ASSE 1024.
4. Operation: Continuous-pressure applications.
5. Size: [NPS 1/2 (DN 15)][NPS 3/4 (DN 20)][NPS 1 (DN 25)][NPS 1-1/4 (DN 32)].
6. Body: Bronze with union inlet.

F. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[WATTS; A Watts Water Technologies Company]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[WATTS; A Watts Water Technologies Company]**
 - b. **<Insert manufacturer's name>**
3. Standard: ASSE 1032.
 4. Operation: Continuous-pressure applications.
 5. Size: **NPS 1/4 or NPS 3/8 (DN 8 or DN 10)**.
 6. Body: Stainless steel.
 7. End Connections: Threaded or flare.

G. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Woodford Manufacturing Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **[Woodford Manufacturing Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
3. Standard: ASSE 1052.
 4. Operation: Up to **10-ft. head of water (30-kPa)** back pressure.
 5. Inlet Size: **NPS 3/4 (DN 20)**.
 6. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
 7. Capacity: At least **3-gpm (0.19-L/s)** flow.

H. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Ames Fire & Waterworks; A Watts Water Technologies Company]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [FEBCO; A WATTS Brand]
 - d. [WATTS; A Watts Water Technologies Company]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ames Fire & Waterworks; A Watts Water Technologies Company]
 - b. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - c. [FEBCO; A WATTS Brand]
 - d. [WATTS; A Watts Water Technologies Company]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
3. Description: Factory calibrated, with gauges, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Caleffi North America]
 - c. [Cash Acme Plumbing Products; an RWC brand]
 - d. [WATTS; A Watts Water Technologies Company]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Caleffi North America]
 - c. [Cash Acme Plumbing Products; an RWC brand]
 - d. [WATTS; A Watts Water Technologies Company]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of **150 psig (1035 kPa)**.
5. Size: <Insert NPS (DN)>.
6. Design Flow Rate: <Insert gpm (L/s)>.
7. Design Inlet Pressure: <Insert psig (kPa)>.
8. Design Outlet Pressure Setting: <Insert psig (kPa)>.

9. Body: Bronze[**with chrome-plated finish**] for **NPS 2 (DN 50)** and smaller; [bronze][**cast iron with interior lining that complies with AWWA C550 or that is FDA approved**] for **NPS 2-1/2 and NPS 3 (DN 65 and DN 80)**.
10. Valves for Booster Heater Water Supply: Include integral bypass.
11. End Connections: Threaded or solder for **NPS 2 (DN 50)** and smaller; flanged or solder for **NPS 2-1/2 and NPS 3 (DN 65 and DN 80)**.

B. Water-Control Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [CLA-VAL]
 - c. [Flomatic Valves; Flomatic Corporation]
 - d. [IMI Hydronic Engineering Inc]
 - e. [OCV Control Valves]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [CLA-VAL]
 - c. [Flomatic Valves; Flomatic Corporation]
 - d. [IMI Hydronic Engineering Inc]
 - e. [OCV Control Valves]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
3. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
4. Pressure Rating: Initial working pressure of **150 psig (1035 kPa)** minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
5. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless steel body.
 - a. Size: <Insert NPS (DN)>.
 - b. Pattern: [Angle][Globe]-valve design.
 - c. Trim: Stainless steel.
6. Design Flow: <Insert gpm (L/s)>.
7. Design Inlet Pressure: <Insert psig (kPa)>.
8. Design Outlet Pressure Setting: <Insert psig (kPa)>.
9. End Connections: Threaded for **NPS 2 (DN 50)** and smaller; [flanged]<Insert type> for **NPS 2-1/2 (DN 65)** and larger.

2.6 AUTOMATIC WATER SHUTOFF VALVE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[FloLogic, Inc.]**
2. **[OnSite PRO Inc]**
3. **[QMI Manufacturing Inc.]**
4. **[RectorSeal Plumbing; A CSW Industrials Company]**
5. **[Reliance Detection Technologies]**
6. **[WaterCop]**
7. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[FloLogic, Inc.]**
2. **[OnSite PRO Inc]**
3. **[QMI Manufacturing Inc.]**
4. **[RectorSeal Plumbing; A CSW Industrials Company]**
5. **[Reliance Detection Technologies]**
6. **[WaterCop]**
7. **<Insert manufacturer's name>**

- C. Shutoff Control Ball Valves and Actuators **<Insert drawing designation if any>**:

1. Size: **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)][NPS 1 (DN 25)][NPS 1-1/4 (DN 32)][NPS 1-1/2 (DN 40)][NPS 2 (DN 50)]<Insert pipe size>**.
2. Design Flow Rate: **<Insert gpm (L/s)>**.
3. Design Inlet Pressure: **<Insert psig (kPa)>**.
4. Control Valve: Two-piece, full-port brass ball valve, MSS SP-110.
 - a. End Connections: Threaded, female.
 - b. Fittings: One **3/8-by-1/2-inch (9.5-by-12.7-mm)** male compression and one **3/8-by-1/2-inch (9.5-by-12.7-mm)** female compression.
 - c. Seats: PTFE.
 - d. O-Rings: FKM.
 - e. Stem: Low-lead brass. Blowout proof.
 - f. CWP Rating: **[600 psig (4140 kPa)]<Insert value>**.
5. Manual-override control turn-knob for emergency operation of valve.
6. Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, fails closed.
 - a. Power Supply: **[Battery][120 V ac][120 V ac step-down transformer][with cord and plug]**.
 - b. Manual Intervention: Allowed.
 - c. Position Indicator: Standard.
7. Actuator Enclosure: Suitable for ambient conditions encountered by application.
8. Wireless Leak Detection System:
 - a. Sensor-Water Flow Type: Pipe-mounted to detect water flow.
 - b. Sensor-Rope Type: Absorbent water sensing rope constructed from twisted metal

- conductor wires insulated from one another and surrounded by polyethylene mesh braid jacket to detect water presence.
- c. Wireless Signal Range: **100 ft. (30.5 m)** minimum between sensors and receiver.
 - d. Self-monitoring enabled system; faults for lost communication between receiver and sensor(s).
 - e. Onboard Battery Backup: 48 hours of protection. [**Valve to close prior to backup failure.**]
 - f. LED Indicators: Wireless signal strength, communication loss, water fault, low-temperature fault, and low battery.
 - g. FCC-Approved Wireless Communication System: Between sensors, repeaters, and receivers.
 - h. Output Contacts: Interface with home security or BAS, cellular text notification service, or auto dialer accessories.
 - i. Wireless Signal Repeater: Boosts signal performance between wireless sensors and receiver.
 - 1) Push-button pairing and unpairing, into and out of the network.
 - 2) Visual indication of wireless signal strength, low battery, and lost communication.
 - 3) Standard wall outlet, 120 V ac, power.
 - 4) Battery Backup: Two (2) AA batteries for battery backup to maintain system integrity during a power outage.
 - j. Wireless Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.
 - k. Hard-Wired Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.
9. Wired Leak Detection System:
- a. Power Supply: Class II transformer with cord and plug, 120 V ac, UL listed.
 - b. Power Cord Length: [12 ft. (3.66 m)]<Insert dimension>.
 - c. Control Panel: LED power and LED valves indicator.
 - d. Alarms: Audible alarm[, **with external output**].
 - e. Output Contacts: Interface with home security or BAS, cellular text notification service, or auto dialer accessories.
 - f. Wired Sensors:
 - 1) Quantity Per Receiver: [One][Two][Three][Four][Five][Six].
 - g. Cable Length: [8 ft. (2.44 m)][25 ft. (7.62 m)][50 ft. (15.2 m)][100 ft. (30.5 m)]<Insert dimension>.
 - h. Cable Adder: [10 ft. (3 m)][25 ft. (7.62 m)][50 ft. (15.2 m)][100 ft. (30.5 m)]<Insert dimension> in length.
- D. Shutoff Control Butterfly Valve and Actuator <Insert drawing designation if any>:
1. Size: [NPS 2-1/2 (DN 65)][NPS 3 (DN 80)][NPS 4 (DN 100)]<Insert pipe size>.
 2. Compliance: MSS SP-67.
 3. Full-port, epoxy-coated, ductile-iron lug body.
 4. Seat: EPDM, **minus 30 deg F to plus 250 deg F (minus 34 deg C to plus 121 deg C)**.
 5. Face-to-Face Flange: ASME B16.5 flanges.
 6. Disc Design: Floating stainless steel dual shaft.
 7. Disc Material: Coated ductile iron.
 8. Locating Pin: Carbon steel.
 9. Bushings: PTFE.
 10. O-Rings: EPDM.
 11. Ten-position stop.

12. Manual-override control turn-knob for emergency operation of valve.
13. Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, fails closed.
 - a. Power Supply: **[Battery][120 V ac][120 V ac step-down transformer][with cord and plug]**.
 - b. Manual Intervention: Allowed.
 - c. Position Indicator: Standard.
14. Actuator Enclosure: Suitable for ambient conditions encountered by application.
15. Wireless Leak Detection System:
 - a. Sensor-Water Flow Type: Pipe-mounted to detect water flow.
 - b. Sensor-Rope Type: Absorbent water sensing rope constructed from twisted metal conductor wires insulated from one another and surrounded by polyethylene mesh braid jacket to detect water presence.
 - c. Wireless Signal Range: **100 ft. (30.5 m)** minimum between sensors and receiver.
 - d. Self-monitoring enabled system; faults for lost communication between receiver and sensor(s).
 - e. Onboard Battery Backup: 48 hours of protection. **[Valve to close prior to backup failure.]**
 - f. LED Indicators: Wireless signal strength, communication loss, water fault, low-temperature fault, and low battery.
 - g. FCC-Approved Wireless Communication System: Between sensors, repeaters, and receivers.
 - h. Output Contacts: Interface with home security or BAS, cellular text notification service, or auto dialer accessories.
 - i. Wireless Signal Repeater: Boosts signal performance between wireless sensors and receiver.
 - 1) Push-button pairing and unpairing, into and out of the network.
 - 2) Visual indication of wireless signal strength, low battery, and lost communication.
 - 3) Standard wall outlet, 120 V ac, power.
 - 4) Battery Backup: Two (2) AA batteries for battery backup to maintain system integrity during a power outage.
 - j. Wireless Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.
 - k. Hard-Wired Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.
16. Wired Leak Detection System:
 - a. Power Supply: Class II transformer with cord and plug, 120 V ac, UL listed.
 - b. Power Cord Length: **[12 ft. (3.66 m)]<Insert dimension>**.
 - c. Control Panel: LED power and LED valves indicator.
 - d. Alarms: Audible alarm, **with external output**.
 - e. Output Contacts: Interface with home security or BAS, cellular text notification service, or auto dialer accessories.
 - f. Wired Sensors:
 - 1) Quantity Per Receiver: **[One][Two][Three][Four][Five][Six]**.
 - g. Cable Length: **[8 ft. (2.44 m)][25 ft. (7.62 m)][50 ft. (15.2 m)][100 ft. (30.5 m)]<Insert dimension>**.
 - h. Cable Adder: **[10 ft. (3 m)][25 ft. (7.62 m)][50 ft. (15.2 m)][100 ft. (30.5 m)]<Insert**

dimension> in length.

E. Clothes Washer Shutoff Control Valve and Actuator <Insert drawing designation if any>:

1. Brass or stainless steel ball valve.
2. End Connections: Male hose connections, **NPS 3/4 (DN 20)**.
3. Pressure Rating: **400 psi (2758 kPa) at 32 to 150 deg F (0 to 65.6 deg C)**.
4. Valve Actuator:
 - a. Enclosure: Suitable for ambient conditions encountered by application.
 - b. Power Supply: **[Battery][120 V ac][120 V ac step-down transformer][with cord and plug]**.
 - c. Position Indicator: Standard.
5. Wired Leak Detection System:
 - a. Water sensor with minimum **6-ft. (1.8-m)** length of wire.
 - b. 120 V ac step-down transformer with cord and plug.
 - c. LED operation and leak notification.
 - d. Audible alarm.
 - e. Power failure or manual disconnection of power causes valves to close.

F. Accessories:

1. Electrical Plug Interrupter: Plugs into standard 120 V ac wall outlet.
2. Gas Flow Interrupter: ECO connector with female spade connectors. Factory prewired, **8 ft. (2.44 m)**.
3. Gas Interface Cable: Interface cable with male and female connectors.
4. Step-Down Transformer: **[120][208][240]** V ac to 24 V ac with mounting plate, **12-ft. (3.66-m)** plenum wire to power, and **8-ft. (2.44-m)** plenum wire to sensor.
5. Liquid Level Sensors: Monitor fluid levels in addition to detecting plumbing leaks.
6. Auto Dialer: Send and receive automatic alerts when a fault condition occurs. Standard output contacts trigger up to nine predetermined telephone number calls.
 - a. Prerecord message for future playback.
 - b. 10-second recordable message.
 - c. Built-in tamper switch.
 - d. DC adaptor with battery backup.
 - e. Programmable as a silent (dialer only) or audible (siren and dialer) alarm.
 - f. Easy "Stop Call Sequence" - push "#" on phone to acknowledge the alarm and stop the dialing sequence.
7. Cellular Text Notification System:
 - a. Event SMS text notification to up to three cell phones.
 - b. Battery Backup: Four (4) AA batteries.
 - c. **12-ft. (3.66-m)** interface cable to leak detection system.
 - d. Customized messaging.
 - e. **<Insert wireless network service provider>**.

2.7 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Bell & Gossett; a Xylem brand]
 - b. [IMI Hydronic Engineering Inc]
 - c. [Nexus Valve, Inc.; Aalberts Hydronic Flow Control]
 - d. [NIBCO INC.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Bell & Gossett; a Xylem brand]
 - b. [IMI Hydronic Engineering Inc]
 - c. [Nexus Valve, Inc.; Aalberts Hydronic Flow Control]
 - d. [NIBCO INC.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. <Insert manufacturer's name>
3. Type: [Ball][or][Y-pattern globe] valve with two readout ports and memory-setting indicator.
 4. Body: [Brass][or][bronze].
 5. Size: Same as connected piping, but not larger than **NPS 2 (DN 50)**.
 6. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Caleffi North America]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [Hammond Valve]
 - e. [Jenkins Valves; a Crane Co. brand]
 - f. [Milwaukee Valve Company]
 - g. [NIBCO INC.]
 - h. [Red-White Valve Corp.]
 - i. [Stockham; a Crane Co. brand]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - b. [Caleffi North America]
 - c. [Crane Fluid Systems; Crane Co.]
 - d. [Hammond Valve]
 - e. [Jenkins Valves; a Crane Co. brand]
 - f. [Milwaukee Valve Company]

- g. [NIBCO INC.]
- h. [Red-White Valve Corp.]
- i. [Stockham; a Crane Co. brand]
- j. <Insert manufacturer's name>

- 3. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
- 4. Pressure Rating: **400-psig (2760-kPa)** minimum CWP.
- 5. Size: **NPS 2 (DN 50)** or smaller.
- 6. Body: Copper alloy.
- 7. Port: Standard or full port.
- 8. Ball: Chrome-plated brass or stainless steel.
- 9. Seats and Seals: Replaceable.
- 10. End Connections: Solder joint or threaded.
- 11. Handle: Vinyl-covered steel with memory-setting device.

C. Automatic Flow Control Balancing Valves:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Acorn Controls; a Division of Morris Group International]
 - b. [Caleffi North America]
 - c. [IMI Hydronic Engineering Inc]
 - d. [ThermOmegaTech]
 - e. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Acorn Controls; a Division of Morris Group International]
 - b. [Caleffi North America]
 - c. [IMI Hydronic Engineering Inc]
 - d. [ThermOmegaTech]
 - e. <Insert manufacturer's name>
- 3. Flow Regulation: Plus or minus 5 percent over 95 percent of the working range.
- 4. Pressure Rating: **200 psig (1380 kPa)**.
- 5. Size: **NPS 2 (DN 50)** or smaller.
- 6. Body: Stainless steel or brass.
- 7. Flow Cartridge: Stainless steel or antiscaling polymer.
- 8. End Connections: Threaded or solder joint.

2.8 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Acorn Controls; a Division of Morris Group International]

- b. [Acorn Engineering Company; a Division of Morris Group International]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Cash Acme Plumbing Products; an RWC brand]
 - e. [POWERS; A Watts Water Technologies Company]
 - f. [Symmons Industries, Inc]
 - g. [Taco Comfort Solutions]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Acorn Controls; a Division of Morris Group International]
 - b. [Acorn Engineering Company; a Division of Morris Group International]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Cash Acme Plumbing Products; an RWC brand]
 - e. [POWERS; A Watts Water Technologies Company]
 - f. [Symmons Industries, Inc]
 - g. [Taco Comfort Solutions]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>
3. Standard: ASSE 1070.
 4. Pressure Rating: **125 psig (860 kPa)**.
 5. Type: Thermostatically controlled, water mixing valve.
 6. Material: Bronze body with corrosion-resistant interior components.
 7. Connections: Threaded[**union**] inlets and outlet.
 8. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 9. Tempered-Water Setting: <Insert **deg F (deg C)**>.
 10. Tempered-Water Design Flow Rate: <Insert **gpm (L/s)**>.
 11. Valve Finish: [**Chrome plated**][**Rough bronze**].
- B. Primary, Thermostatic, Water Mixing Valves:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Acorn Controls; a Division of Morris Group International]
 - b. [Acorn Engineering Company; a Division of Morris Group International]
 - c. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - d. [Caleffi North America]
 - e. [Cash Acme Plumbing Products; an RWC brand]
 - f. [Lawler Manufacturing Company, Inc]
 - g. [POWERS; A Watts Water Technologies Company]
 - h. [Symmons Industries, Inc]
 - i. [WATTS; A Watts Water Technologies Company]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Controls; a Division of Morris Group International]**
 - b. **[Acorn Engineering Company; a Division of Morris Group International]**
 - c. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - d. **[Caleffi North America]**
 - e. **[Cash Acme Plumbing Products; an RWC brand]**
 - f. **[Lawler Manufacturing Company, Inc]**
 - g. **[POWERS; A Watts Water Technologies Company]**
 - h. **[Symmons Industries, Inc]**
 - i. **[WATTS; A Watts Water Technologies Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
3. Standard: ASSE 1017.
4. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
5. Type: **[Exposed-mounted][Cabinet-type]**, thermostatically controlled, water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded **[union]** inlets and outlet.
8. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
9. Tempered-Water Setting: **<Insert deg F (deg C)>**.
10. Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
11. Selected Valve Flow Rate at 45-psig (310-kPa) Pressure Drop: **<Insert gpm (L/s)>**.
12. Pressure Drop at Design Flow Rate: **<Insert psig (kPa)>**.
13. Valve Finish: **[Chrome plated][Polished, chrome plated][Rough bronze]**.
14. Piping Finish: **[Chrome plated][Copper]**.
15. Cabinet: Factory fabricated, stainless steel, for **[recessed][surface]** mounting and with hinged, stainless steel door.

C. Primary, Electronic, Water Mixing Valve Assemblies:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Controls; a Division of Morris Group International]**
 - b. **[Acorn Engineering Company; a Division of Morris Group International]**
 - c. **[Caleffi North America]**
 - d. **[Leonard Valve Company]**
 - e. **[POWERS; A Watts Water Technologies Company]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Controls; a Division of Morris Group International]**
 - b. **[Acorn Engineering Company; a Division of Morris Group International]**
 - c. **[Caleffi North America]**
 - d. **[Leonard Valve Company]**
 - e. **[POWERS; A Watts Water Technologies Company]**
 - f. **<Insert manufacturer's name>**

3. Standard: ASSE 1017.
4. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
5. Type: Exposed, electronically controlled, water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded or solder joint inlets and outlet.
8. Accessories: Manual temperature override control, check stops on hot- and cold-water supplies, and automatic hot- and cold-water shutoff upon inlet supply failure.
9. Tempered-Water Setting: **<Insert deg F (deg C)>**.
10. Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
11. Selected Valve Flow Rate at 45-psig (310-kPa) Pressure Drop: **<Insert gpm (L/s)>**.
12. Pressure Drop at Design Flow Rate: **<Insert psig (kPa)>**.
13. Valve Finish: Bronze.
14. Digital temperature control and monitoring module.
 - a. Controls temperature within plus or minus **2 deg F (1 deg C)**.
 - b. User programmable at module or through BAS.
 - c. ASHRAE 188 compliance.
 - d. Local and remote monitoring.
 - e. **[BACNet][Modbus][Metasys][Ethernet]** protocol language(s).
 - f. **[115][230]** V ac, 60 Hz.
 - g. Battery backup.

D. Manifold, Thermostatic, Water Mixing Valve Assemblies:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[POWERS; A Watts Water Technologies Company]**
 - c. **[Symmons Industries, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[POWERS; A Watts Water Technologies Company]**
 - c. **[Symmons Industries, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **<Insert manufacturer's name>**
3. Description: Factory-fabricated, **[cabinet-type][exposed-mounted]**, thermostatically controlled, water mixing valve assembly in **[two][three]**-valve parallel arrangement.
4. Large-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gauges on inlet and outlet.
5. Intermediate-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gauges on inlet and outlet.
6. Small-Flow Parallel: Thermostatic, water mixing valve.
7. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
8. Water Regulator(s): Comply with ASSE 1003. Include pressure gauge on inlet and outlet.

9. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
10. Cabinet: Factory fabricated, stainless steel, for **[recessed][surface]** mounting and with hinged, stainless steel door.
11. Selected Large-Flow, Tempered-Water Valve Size: **<Insert size>**.
12. Tempered-Water Setting: **<Insert deg F (deg C)>**.
13. Unit Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
14. Unit Minimum Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
15. Selected Unit Flow Rate at **45-psig (310-kPa)** Pressure Drop: **<Insert gpm (L/s)>**.
16. Unit Pressure Drop at Design Flow Rate: **<Insert psig (kPa)>**.
17. Unit Tempered-Water Outlet Size: **<Insert NPS (DN)>** end connection.
18. Unit Hot- and Cold-Water Inlet Size: **<Insert NPS (DN)>** end connections.
19. Thermostatic Mixing Valve and Water Regulator Finish: **[Chrome plated][Polished, chrome plated][Rough bronze]**.
20. Piping Finish: **[Chrome plated][Copper]**.

E. Photographic-Process, Thermostatic, Water Mixing Valve Assemblies:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[POWERS; A Watts Water Technologies Company]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[POWERS; A Watts Water Technologies Company]**
 - b. **[WATTS; A Watts Water Technologies Company]**
 - c. **<Insert manufacturer's name>**
3. Standard: ASSE 1017, thermostatically controlled, water mixing valve made for precise, process-water temperature control.
4. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, thermometer, shutoff valve, and adjustable, temperature-control handle.
8. Cabinet: Factory fabricated, stainless steel, for surface mounting; with controls and thermometer mounted on front.
9. Tempered-Water Setting: **<Insert deg F (deg C)>**.
10. Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
11. Tempered-Water Outlet Size: **<Insert NPS (DN)>** end connection.
12. Hot- and Cold-Water Inlet Size: **<Insert NPS (DN)>** end connections.

F. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Acorn Controls; a Division of Morris Group International]**

- b. [Acorn Engineering Company; a Division of Morris Group International]
- c. [Caleffi North America]
- d. [Lawler Manufacturing Company, Inc]
- e. [POWERS; A Watts Water Technologies Company]
- f. [Zurn Industries, LLC]
- g. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Acorn Controls; a Division of Morris Group International]
- b. [Acorn Engineering Company; a Division of Morris Group International]
- c. [Caleffi North America]
- d. [Lawler Manufacturing Company, Inc]
- e. [POWERS; A Watts Water Technologies Company]
- f. [Zurn Industries, LLC]
- g. <Insert manufacturer's name>

3. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
4. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
5. Material: Bronze body with corrosion-resistant interior components.
6. Temperature Control: Adjustable.
7. Connections: Threaded inlets and outlet.
8. Finish: Chrome plated.
9. Tempered-Water Setting: <Insert deg F (deg C)>.
10. Tempered-Water Design Flow Rate: <Insert gpm (L/s)>.

G. Primary Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Acorn Controls; a Division of Morris Group International]
- b. [Heat-Timer Corporation]
- c. [Holby Valve Inc.]
- d. [WATTS; A Watts Water Technologies Company]
- e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Acorn Controls; a Division of Morris Group International]
- b. [Heat-Timer Corporation]
- c. [Holby Valve Inc.]
- d. [WATTS; A Watts Water Technologies Company]
- e. <Insert manufacturer's name>

3. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.
4. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
5. Material: Bronze body.

6. Temperature Control: Manual.
7. Connections: Threaded inlets and outlet.
8. Selected Primary Water Tempering Valve Size: **<Insert size>**.
9. Tempered-Water Setting: **<Insert deg F (deg C)>**.
10. Tempered-Water Design Flow Rate: **<Insert gpm (L/s)>**.
11. Pressure Drop at Design Flow Rate: **<Insert psig (kPa)>**.
12. Tempered-Water Outlet Size: **<Insert NPS (DN)>** end connection.
13. Cold-Water Inlet Size: **<Insert NPS (DN)>** end connection.
14. Hot-Water Inlet Size: **<Insert NPS (DN)>** end connection.
15. Valve Finish: **[Rough bronze]<Insert finish>**.

2.9 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Caleffi North America]**
 - b. **[Keckley Company]**
 - c. **[Titan Flow Control, Inc.]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Caleffi North America]**
 - b. **[Keckley Company]**
 - c. **[Titan Flow Control, Inc.]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
3. Pressure Rating: **125 psig (860 kPa)** minimum unless otherwise indicated.
4. Body: Bronze for **NPS 2 (DN 50)** and smaller; cast iron **[with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and]** for **NPS 2-1/2 (DN 65)** and larger.
5. End Connections: Threaded for **NPS 2 (DN 50)** and smaller; flanged for **NPS 2-1/2 (DN 65)** and larger.
6. Screen: Stainless steel with round perforations unless otherwise indicated.
7. Perforation Size:
 - a. Strainers NPS 2 (DN 50) and Smaller: **[0.020 inch (0.51 mm)][0.033 inch (0.84 mm)][0.062 inch (1.57 mm)]<Insert dimension>**.
 - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): **[0.045 inch (1.14 mm)][0.062 inch (1.57 mm)][0.125 inch (3.18 mm)]<Insert dimension>**.
 - c. Strainers NPS 5 (DN 125) and Larger: **[0.10 inch (2.54 mm)][0.125 inch (3.18 mm)][0.25 inch (6.35 mm)]<Insert dimension>**.
8. Drain: **[Pipe plug][Factory-installed, hose-end drain valve]**.

2.10 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[Guy Gray, IPS Corporation]**
 - c. **[LSP Products Group]**
 - d. **[Oatey Co.]**
 - e. **[Sioux Chief Manufacturing Company, Inc.]**
 - f. **[Symmons Industries, Inc]**
 - g. **[Water-Tite, IPS Corporation]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Acorn Engineering Company; a Division of Morris Group International]**
 - b. **[Guy Gray, IPS Corporation]**
 - c. **[LSP Products Group]**
 - d. **[Oatey Co.]**
 - e. **[Sioux Chief Manufacturing Company, Inc.]**
 - f. **[Symmons Industries, Inc]**
 - g. **[Water-Tite, IPS Corporation]**
 - h. **<Insert manufacturer's name>**
3. Mounting: Recessed. **[Fire rated.]**
4. Material and Finish: **[Enameled-steel or epoxy-painted-steel][Enameled-steel, epoxy-painted-steel, or plastic][Plastic][Stainless steel]** box and faceplate.
5. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
6. Drain Outlet Connection: **[NPS 1-1/2 (DN 40)][NPS 2 (DN 50)]**.
7. Accessory: Water hammer arresters.
8. Supply Shutoff Fittings: **NPS 1/2 (DN 15)** gate, globe, or ball valves and **NPS 1/2 (DN 15)** copper, water tubing.
9. Drain: **[NPS 1-1/2 (DN 40)][NPS 2 (DN 50)]** standpipe and P-trap for direct waste connection to drainage piping.
10. Inlet Hoses: Two **60-inch- (1500-mm-)** long, rubber, household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
11. Drain Hose: One **48-inch- (1200-mm-)** long, rubber, household clothes washer drain hose with hooked end.

B. Ice maker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Guy Gray, IPS Corporation]**

- b. [LSP Products Group]
 - c. [Oatey Co.]
 - d. [Sioux Chief Manufacturing Company, Inc.]
 - e. [Water-Tite, IPS Corporation]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Guy Gray, IPS Corporation]
 - b. [LSP Products Group]
 - c. [Oatey Co.]
 - d. [Sioux Chief Manufacturing Company, Inc.]
 - e. [Water-Tite, IPS Corporation]
 - f. <Insert manufacturer's name>
- 3. Mounting: Recessed.[Fire rated.]
- 4. Material and Finish: [Enameled-steel or epoxy-painted-steel][Enameled-steel, epoxy-painted-steel, or plastic][Plastic][Stainless steel] box and faceplate.
- 5. Faucet: Valved fitting complying with ASME A112.18.1. Include **NPS 1/2 (DN 15)** or smaller copper tube outlet.
- 6. Accessory: Water hammer arrestor.
- 7. Supply Shutoff Fitting: **NPS 1/2 (DN 15)** gate, globe, or ball valve and **NPS 1/2 (DN 15)** copper, water tubing.

2.11 HOSE STATIONS

A. Single-Temperature-Water Hose Stations:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARCHON Industries, Inc]
 - b. [Armstrong International, Inc]
 - c. [DynaFluid Ltd.]
 - d. [Strahman Valves, Inc]
 - e. [T&S Brass and Bronze Works, Inc.]
 - f. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARCHON Industries, Inc]
 - b. [Armstrong International, Inc]
 - c. [DynaFluid Ltd.]
 - d. [Strahman Valves, Inc]
 - e. [T&S Brass and Bronze Works, Inc.]
 - f. <Insert manufacturer's name>
- 3. Standard: ASME A112.18.1.
- 4. Cabinet: Stainless steel enclosure with exposed valve handle, hose connection, and hose rack.

- Include thermometer in front.
- 5. Hose-Rack Material: Stainless steel.
- 6. Body Material: Bronze[**with stainless steel wetted parts**].
- 7. Body Finish: Rough bronze[, **chrome plated**].
- 8. Mounting: **[Wall, with reinforcement][Floor, with stainless steel pedestal]**.
- 9. Supply Fittings: **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)]** gate, globe, or ball valve and check valve and **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)]** copper, water tubing. Omit check valve if check stop is included with fitting.
- 10. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; **[25 ft. (7.6 m)][50 ft. (15 m)]**<Insert dimension> long.
- 11. Nozzle: With hand-squeeze, on-off control.
- 12. Vacuum Breaker:
 - a. Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.

B. Hot- and Cold-Water Hose Stations:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ARCHON Industries, Inc]**
 - b. **[Armstrong International, Inc]**
 - c. **[Cooney Brothers, Inc]**
 - d. **[DynaFluid Ltd.]**
 - e. **[Strahman Valves, Inc]**
 - f. **[T&S Brass and Bronze Works, Inc.]**
 - g. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ARCHON Industries, Inc]**
 - b. **[Armstrong International, Inc]**
 - c. **[Cooney Brothers, Inc]**
 - d. **[DynaFluid Ltd.]**
 - e. **[Strahman Valves, Inc]**
 - f. **[T&S Brass and Bronze Works, Inc.]**
 - g. **<Insert manufacturer's name>**
- 3. Standard: ASME A112.18.1.
- 4. Faucet Type: **[Blending][Thermostatic mixing]** valve.
- 5. Cabinet: Stainless steel enclosure with exposed valve handles, hose connection, and hose rack. Include thermometer in front.
- 6. Hose-Rack Material: Stainless steel.
- 7. Body Material: Bronze[**with stainless steel wetted parts**].
- 8. Body Finish: Rough bronze[**or chrome plated**].
- 9. Mounting: **[Wall, with reinforcement][Floor, with stainless steel pedestal]**.
- 10. Supply Fittings: Two **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)]** gate, globe, or ball valves and check valves and **[NPS 1/2 (DN 15)][NPS 3/4 (DN 20)]** copper, water tubing. Omit check valves if check stops are included with fitting.

11. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; [25 ft. (7.6 m)][50 ft. (15 m)]<Insert dimension> long.
12. Nozzle: With hand-squeeze, on-off control.
13. Vacuum Breaker: Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052; and garden-hose thread complying with ASME B1.20.7 on outlet.

C. Cold-Water and Steam Hose Stations:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARCHON Industries, Inc]
 - b. [Armstrong International, Inc]
 - c. [DynaFluid Ltd.]
 - d. [Strahman Valves, Inc]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ARCHON Industries, Inc]
 - b. [Armstrong International, Inc]
 - c. [DynaFluid Ltd.]
 - d. [Strahman Valves, Inc]
 - e. <Insert manufacturer's name>
3. Standard: ASME A112.18.1.
4. Faucet Type: [Blending][Thermostatic mixing] valve.
5. Cabinet: Stainless steel enclosure with exposed valve handles, hose connection, and hose rack. Include thermometer in front.
6. Hose-Rack Material: Stainless steel.
7. Body Material: Bronze[with stainless steel wetted parts].
8. Body Finish: Rough bronze[or chrome plated].
9. Mounting: [Wall, with reinforcement][Floor, with stainless steel pedestal].
10. Supply Fittings: Two [NPS 1/2 (DN 15)][NPS 3/4 (DN 20)] gate, globe, or ball valves and check valves and [NPS 1/2 (DN 15)][NPS 3/4 (DN 20)] copper, water tubing. Omit check valves if check stops are included with fitting.
11. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; [25 ft. (7.6 m)][50 ft. (15 m)]<Insert dimension> long.
12. Nozzle: With hand-squeeze, on-off control.
13. Vacuum Breaker:
 - a. Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.

2.12 HOSE BIBBS

A. Hose Bibbs:

1. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
- b. [Josam Company]
- c. [MIFAB, Inc]
- d. [Prier Products, Inc.]
- e. [WATTS; A Watts Water Technologies Company]
- f. [Woodford Manufacturing Company]
- g. [Zurn Industries, LLC]
- h. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
- b. [Josam Company]
- c. [MIFAB, Inc]
- d. [Prier Products, Inc.]
- e. [WATTS; A Watts Water Technologies Company]
- f. [Woodford Manufacturing Company]
- g. [Zurn Industries, LLC]
- h. <Insert manufacturer's name>

- 3. Standard: ASME A112.18.1 for sediment faucets.
- 4. Body Material: Bronze.
- 5. Seat: Bronze, replaceable.
- 6. Supply Connections: **NPS 1/2 or NPS 3/4 (DN 15 or DN 20)** threaded or solder-joint inlet.
- 7. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
- 8. Pressure Rating: **125 psig (860 kPa)**.
- 9. Vacuum Breaker: Integral[**or field-installation,**] nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
- 10. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
- 11. Finish for Service Areas: [**Rough bronze**][**Chrome or nickel plated**].
- 12. Finish for Finished Rooms: Chrome or nickel plated.
- 13. Operation for Equipment Rooms: Wheel handle or operating key.
- 14. Operation for Service Areas: [**Wheel handle**][**Operating key**].
- 15. Operation for Finished Rooms: [**Wheel handle**][**Operating key**].
- 16. Include operating key with each operating-key hose bibb.
- 17. Include[**integral**] wall flange with each chrome- or nickel-plated hose bibb.

2.13 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]

- c. [MIFAB, Inc]
 - d. [Murdock Manufacturing; A Division of Morris Group International]
 - e. [Prier Products, Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Murdock Manufacturing; A Division of Morris Group International]
 - e. [Prier Products, Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
- 3. Standard: ASME A112.21.3M for [concealed][exposed]-outlet, self-draining wall hydrants.
 - 4. Pressure Rating: 125 psig (860 kPa).
 - 5. Operation: Loose key.
 - 6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 - 7. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
 - 8. Outlet, Concealed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 - 9. Box: Deep, flush mounted with cover.
 - 10. Box and Cover Finish: [Polished nickel bronze][Rough bronze]<Insert finish>.
 - 11. Outlet, Exposed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 - 12. Nozzle and Wall-Plate Finish: [Polished nickel bronze][Rough bronze][Chrome plated]<Insert finish>.
 - 13. Operating Keys(s): [One][Two] with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Murdock Manufacturing; A Division of Morris Group International]
 - e. [Prier Products, Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the

following:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Murdock Manufacturing; A Division of Morris Group International]
 - e. [Prier Products, Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Woodford Manufacturing Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
3. Standard: ASME A112.21.3M for [concealed][exposed]-outlet, self-draining wall hydrants.
 4. Pressure Rating: **125 psig (860 kPa)**.
 5. Operation: Loose key.
 6. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
 7. Inlet: **NPS 3/4 or NPS 1 (DN 20 or DN 25)**.
 8. Outlet: Concealed.
 9. Box: Deep, flush mounted with cover.
 10. Box and Cover Finish: [**Polished nickel bronze**][**Chrome plated**]<Insert finish>.
 11. Vacuum Breaker:
 - a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.
 12. Operating Key(s): [**One**][**Two**] with each wall hydrant.

C. Moderate-Climate Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Prier Products, Inc.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Woodford Manufacturing Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Prier Products, Inc.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Woodford Manufacturing Company]
 - g. [Zurn Industries, LLC]

- h. <Insert manufacturer's name>
- 3. Standard: ASME A112.21.3M for [concealed][exposed]-outlet, self-draining wall hydrants.
- 4. Pressure Rating: **125 psig (860 kPa)**.
- 5. Operation: Loose key.
- 6. Inlet: **NPS 3/4 or NPS 1 (DN 20 or DN 25)**.
- 7. Outlet, Concealed:
 - a. With integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
- 8. Box: Deep, flush mounted with cover.
- 9. Box and Cover Finish: **[Polished nickel bronze][Chrome plated]<Insert finish>**.
- 10. Outlet, Exposed:
 - a. With integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
- 11. Nozzle and Wall-Plate Finish: **[Polished nickel bronze][Rough bronze]<Insert finish>**.
- 12. Operating Key(s): **[One][Two]** with each wall hydrant.

D. Nonfreeze Vacuum Breaker Wall Hydrants:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Champion-Arrowhead]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - d. **[Prier Products, Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Woodford Manufacturing Company]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Champion-Arrowhead]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - d. **[Prier Products, Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Woodford Manufacturing Company]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
- 3. Standard: ASSE 1019, Type A or Type B.
- 4. Type: Automatic draining with integral air-inlet valve.
- 5. Classification: **[Type A, for automatic draining with hose removed or]Type B, for automatic draining with hose removed or with hose attached and nozzle closed.**

6. Pressure Rating: **125 psig (860 kPa)**.
7. Operation: **[Loose key][or][wheel handle]**.
8. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
9. Inlet: **NPS 1/2 or NPS 3/4 (DN 15 or DN 20)**.
10. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.14 GROUND HYDRANTS

A. Nonfreeze Ground Hydrants:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Murdock Manufacturing; A Division of Morris Group International]**
 - e. **[Prier Products, Inc.]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Woodford Manufacturing Company]**
 - h. **[Zurn Industries, LLC]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Murdock Manufacturing; A Division of Morris Group International]**
 - e. **[Prier Products, Inc.]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Woodford Manufacturing Company]**
 - h. **[Zurn Industries, LLC]**
 - i. **<Insert manufacturer's name>**
3. Standard: ASME A112.21.3M.
4. Type: Nonfreeze, concealed-outlet ground hydrant with box.
5. Operation: Loose key.
6. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
7. Inlet: **[NPS 3/4 (DN 20)]<Insert pipe size>**.
8. Outlet: Garden-hose thread complying with ASME B1.20.7.
9. Drain: Designed with hole to drain into ground when shut off.
10. Box: **[Standard][Deep]** pattern with cover.
11. Box and Cover Finish: **[Rough][Polished nickel]<Insert finish>** bronze.
12. Operating Key(s): **[One][Two]** with each ground hydrant.
13. Vacuum Breaker: ASSE 1011.

2.15 POST HYDRANTS

A. Nonfreeze, Draining-Type Post Hydrants:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Murdock Manufacturing; A Division of Morris Group International]**
 - e. **[Prier Products, Inc.]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Woodford Manufacturing Company]**
 - h. **[Zurn Industries, LLC]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Murdock Manufacturing; A Division of Morris Group International]**
 - e. **[Prier Products, Inc.]**
 - f. **[WATTS; A Watts Water Technologies Company]**
 - g. **[Woodford Manufacturing Company]**
 - h. **[Zurn Industries, LLC]**
 - i. **<Insert manufacturer's name>**
3. Standard: ASME A112.21.3M.
4. Type: Nonfreeze, exposed-outlet post hydrant.
5. Operation: Loose key.
6. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
7. Casing: Bronze with casing guard.
8. Inlet: **[NPS 3/4 (DN 20)]<Insert pipe size>**.
9. Outlet: Garden-hose thread complying with ASME B1.20.7.
10. Drain: Designed with hole to drain into ground when shut off.
11. Vacuum Breaker:
 - a. Nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.
12. Operating Key(s): **[One][Two]** with each loose-key-operation wall hydrant.

B. Nonfreeze Sanitary Yard Hydrants:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**



- a. [Hoeptner Products]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Woodford Manufacturing Company]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Hoeptner Products]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Woodford Manufacturing Company]
 - e. <Insert manufacturer's name>
3. Standard: ASSE 1057.
4. Operation: Wheel handle or lever.
5. Head: Cast iron or brass, with pail hook.
6. Inlet: **NPS 3/4 or NPS 1 (DN 20 or DN 25)** threaded.
7. Length: As required for burial of valve and canister below frost line.
8. Canister: [**Stainless steel**]<Insert material>.
9. Vacuum Breaker:
- a. Removable hose-connection backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet for field installation.

2.16 ROOF HYDRANTS

A. Nonfreeze, Draining-Type Roof Hydrants:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Prier Products, Inc.]
 - e. [WATTS; A Watts Water Technologies Company]
 - f. [Woodford Manufacturing Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Murdock Manufacturing; A Division of Morris Group International]
 - d. [Prier Products, Inc.]
 - e. [WATTS; A Watts Water Technologies Company]

- f. [Woodford Manufacturing Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
- 3. Standard: ASME A112.21.3M.
 - 4. Type: Nonfreeze, exposed-outlet roof hydrant with coated cast-iron head and lift handle with lock option. Provide with deck flange and under deck clamp.
 - 5. Casing and Operating Rod: Bronze interior parts, galvanized-steel casing, and bronze valve housing designed with hole to drain.
 - 6. Inlet: **NPS 3/4 (DN 20)]<Insert pipe size>**.
 - 7. Outlet: Garden-hose thread complying with ASME B1.20.7.
 - 8. Vacuum Breaker:
 - a. Nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7 on outlet.

2.17 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves <Insert drawing designation if any>:

- 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
- 2. Pressure Rating: **400-psig (2760-kPa)** minimum CWP.
- 3. Size: **NPS 3/4 (DN 20)**.
- 4. Body: Copper alloy.
- 5. Ball: Chrome-plated brass.
- 6. Seats and Seals: Replaceable.
- 7. Handle: Vinyl-covered steel.
- 8. Inlet: Threaded or solder joint.
- 9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves <Insert drawing designation if any>:

- 1. Standard: MSS SP-80 for gate valves.
- 2. Pressure Rating: Class 125.
- 3. Size: **NPS 3/4 (DN 20)**.
- 4. Body: ASTM B62 bronze.
- 5. Inlet: **NPS 3/4 (DN 20)** threaded or solder joint.
- 6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves <Insert drawing designation if any>:

- 1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
- 2. Pressure Rating: **200-psig (1380-kPa)** minimum CWP or Class 125.
- 3. Size: **NPS 3/4 (DN 20)**.
- 4. Body: Copper alloy or ASTM B62 bronze.
- 5. Drain: **NPS 1/8 (DN 6)** side outlet with cap.

2.18 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [AMTROL, Inc.]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Josam Company]
 - d. [MIFAB, Inc]
 - e. [Precision Plumbing Products]
 - f. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - g. [Sioux Chief Manufacturing Company, Inc.]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [AMTROL, Inc.]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Josam Company]
 - d. [MIFAB, Inc]
 - e. [Precision Plumbing Products]
 - f. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - g. [Sioux Chief Manufacturing Company, Inc.]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: [Metal bellows][Piston][Diaphragm].
5. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.19 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Precision Plumbing Products]
 - e. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - f. [Sioux Chief Manufacturing Company, Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
- b. [Josam Company]
- c. [MIFAB, Inc]
- d. [Precision Plumbing Products]
- e. [ProFlo; a Ferguson Enterprises, Inc. brand]
- f. [Sioux Chief Manufacturing Company, Inc.]
- g. [WATTS; A Watts Water Technologies Company]
- h. [Zurn Industries, LLC]
- i. <Insert manufacturer's name>

- 3. Standard: ASSE 1018.
- 4. Pressure Rating: **125 psig (860 kPa)** minimum.
- 5. Body: Bronze.
- 6. Inlet and Outlet Connections: **NPS 1/2 (DN 15)** threaded, union, or solder joint.
- 7. Gravity Drain Outlet Connection: **NPS 1/2 (DN 15)** threaded or solder joint.
- 8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Precision Plumbing Products]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [MIFAB, Inc]
 - c. [Precision Plumbing Products]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
- 3. Standard: ASSE 1044, lavatory P-trap with **NPS 3/8 (DN 10)** minimum, trap makeup connection.
- 4. Size: **NPS 1-1/4 (DN 32)** minimum.
- 5. Material: Chrome-plated, cast brass.

2.20 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. **[Precision Plumbing Products]**
 - b. **[Sioux Chief Manufacturing Company, Inc.]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Precision Plumbing Products]**
 - b. **[Sioux Chief Manufacturing Company, Inc.]**
 - c. **[Zurn Industries, LLC]**
 - d. **<Insert manufacturer's name>**
3. Standard: ASSE 1044.
4. Inlet Size: **NPS 3/4, ASTM B88, Type L (DN 20, ASTM B88M, Type B)**; copper, water tubing.
5. Cabinet: **[Recessed][Surface]**-mounted steel box with stainless steel cover.
6. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120 V ac power.
- a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
7. Vacuum Breaker: ASSE 1001.
8. Number Outlets: **[Four][Six][Eight]<Insert number>**.
9. Size Outlets: **[NPS 1/2 (DN 15)][NPS 5/8 (DN 18)]**.

2.21 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Flex-Hose Co., Inc]**
 2. **[Mason Industries, Inc.]**
 3. **[Metraflex Company (The)]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Flex-Hose Co., Inc]**
 2. **[Mason Industries, Inc.]**
 3. **[Metraflex Company (The)]**
 4. **<Insert manufacturer's name>**
- C. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: Minimum **[200 psig (1380 kPa)][250 psig (1725 kPa)]**.
 2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.

- D. Stainless Steel-Hose Flexible Connectors: Corrugated-stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: Minimum **[200 psig (1380 kPa)][250 psig (1725 kPa)]**.
 2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.
 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

2.22 WATER METERS

A. Displacement-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Badger Meter, Inc.]**
 - b. **[Carlson Meter]**
 - c. **[Master Meter, Inc]**
 - d. **[Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]**
 - e. **[Neptune Technology Group Inc.]**
 - f. **[Niagara Meters]**
 - g. **[Sensus; a Xylem brand]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Badger Meter, Inc.]**
 - b. **[Carlson Meter]**
 - c. **[Master Meter, Inc]**
 - d. **[Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]**
 - e. **[Neptune Technology Group Inc.]**
 - f. **[Niagara Meters]**
 - g. **[Sensus; a Xylem brand]**
 - h. **<Insert manufacturer's name>**
3. Standard: AWWA C700.
4. Pressure Rating: **150-psig (1035-kPa)** working pressure.
5. Body Design: Nutating disc; totalization meter.
6. Registration: In **gallons (liters)** or **cubic feet (cubic meters)** as required by utility company.
 - a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
 - 1) System to be capable of transmitting data using AMR/AMI technology.
7. Case: **[Bronze][Stainless steel]**.
8. End Connections: Threaded or flanged.

B. Turbine-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Badger Meter, Inc.]
- b. [Carlson Meter]
- c. [Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]
- d. [Neptune Technology Group Inc.]
- e. [Niagara Meters]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Badger Meter, Inc.]
- b. [Carlson Meter]
- c. [Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]
- d. [Neptune Technology Group Inc.]
- e. [Niagara Meters]
- f. <Insert manufacturer's name>

3. Standard: AWWA C701.
4. Pressure Rating: [150 psig (1035 kPa)]<Insert value> working pressure.
5. Body Design: Turbine; totalization meter.
6. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.
 - a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
 - 1) System to be capable of transmitting data using AMR/AMI technology.
7. Case: [Bronze][Epoxy-coated cast iron].
8. End Connections: Threaded or flanged.

C. Compound-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Badger Meter, Inc.]
 - b. [Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]
 - c. [Neptune Technology Group Inc.]
 - d. [Sensus; a Xylem brand]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Badger Meter, Inc.]
 - b. [Mueller Systems, LLC; a subsidiary of Mueller Water Products, Inc.]

- c. **[Neptune Technology Group Inc.]**
 - d. **[Sensus; a Xylem brand]**
 - e. **<Insert manufacturer's name>**
- 3. Standard: AWWA C702.
 - 4. Pressure Rating: **150-psig (1035-kPa)** working pressure.
 - 5. Body Design: With integral mainline and bypass meters; totalization meter.
 - 6. Registration: In **gallons (liters)** or **cubic feet (cubic meters)** as required by utility company.
 - a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
 - 1) System to be capable of transmitting data using AMR/AMI technology.
- 7. Case: **[Bronze][Coated ductile iron]**.
 - 8. End Connections: Flanged.
- D. Ultrasonic-Type Water Meters:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Badger Meter, Inc.]**
 - b. **[Master Meter, Inc]**
 - c. **[Neptune Technology Group Inc.]**
 - d. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Badger Meter, Inc.]**
 - b. **[Master Meter, Inc]**
 - c. **[Neptune Technology Group Inc.]**
 - d. **<Insert manufacturer's name>**
 - 3. Standard: Applicable portions of AWWA C700.
 - 4. Pressure Rating: **[150 psig (1035 kPa)]<Insert value>** working pressure.
 - 5. Body Design: Ultrasonic open flow tube; totalization meter.
 - 6. Registration: In **gallons (liters)** or **cubic feet (cubic meters)** as required by utility company.
 - a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
 - 1) System to be capable of transmitting data using AMR/AMI technology.
 - 7. Case: **[Bronze][Stainless steel][Engineered polymer][Epoxy-coated ductile iron]**.
 - 8. End Connections: Threaded or flanged.

PART 3 - EXECUTION**3.1 INSTALLATION OF PIPING SPECIALTIES**

- A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Water Regulators: Install with inlet and outlet shutoff valves[**and bypass with memory-stop balancing valve**]. Install pressure gauges on inlet and outlet.
- C. Water Control Valves: Install with inlet and outlet shutoff valves[**and bypass with globe valve**]. Install pressure gauges on inlet and outlet.
- D. Automatic Water Shutoff Valves: Test for signal strength before valve installation. Install automatic shutoff valve downstream from main domestic water shutoff valve. Install valve controller in an accessible location with sensors in areas where water is likely to accumulate.
- E. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
- F. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- G. Y-Pattern Strainers: For water, install on supply side of each [**control valve**][**water pressure-reducing valve**][**solenoid valve**][**and**][**pump**].
- H. Outlet Boxes: Install boxes recessed in wall or surface mounted on wall. Install **1-1/2-by-3-1/2-inch (38-by-89-mm)** fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- I. Hose Stations: Install with check stops or shutoff valves on inlets and with thermometer on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified. Install **1-1/2-by-3-1/2-inch (38-by-89-mm)** fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- J. Ground Hydrants: Install with [**1 cu. yd. (0.75 cu. m)**]**<Insert dimension>** of crushed gravel around drain hole. Set ground hydrants with box flush with grade.
- K. Nonfreeze, Draining-Type Post Hydrants: Install with [**1 cu. yd. (0.75 cu. m)**]**<Insert dimension>** of crushed gravel around drain hole. Set post hydrants in concrete paving or in [**1 cu. ft. (0.03 cu. m)**]**<Insert dimension>** of concrete block at grade.

- L. Nonfreeze, Nondraining-Type Post Hydrants: Set in concrete or pavement.
- M. Nonfreeze, Sanitary Yard Hydrants: Set with riser pipe in concrete or pavement. Do not encase canister in concrete.
- N. Nonfreeze, Draining-Type Roof Hydrants: Install with drain connection piped to nearest floor drain or to the exterior.
- O. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.
- P. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- Q. Drainage-Type, Trap-Seal Primer Device: Install as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- R. Trap-Seal Primer Systems: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 CONTROL CONNECTIONS

- A. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.5 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Automatic water shutoff valve systems.
 - 5. Balancing valves.
 - 6. Temperature-actuated, water mixing valves.

7. Outlet boxes.
8. Hose stations.
9. Wall hydrants.
10. Ground hydrants.
11. Post hydrants.
12. Roof hydrants.
13. Trap-seal primer device.
14. Trap-seal primer systems.
15. Water meters.

- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.6 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.
- D. Adjust each **[pressure vacuum breaker][reduced-pressure-principle backflow preventer][double-check, backflow-prevention assembly][and][double-check, detector-assembly backflow preventer]**<Insert type> in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**.
1. Test each **[pressure vacuum breaker][reduced-pressure-principle backflow preventer][double-check, backflow-prevention assembly][and][double-check, detector-assembly backflow preventer]**<Insert type> according to authorities having jurisdiction and the device's reference standard.
 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.



END OF SECTION 22 11 19 00

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Task	Specification	Specification Description
22 11 19 00	21 05 00 00	Common Work Results for Fire Suppression
22 11 19 00	22 05 00 00	Common Work Results for Plumbing
22 11 19 00	22 11 00 00	Gray-Water Piping
22 11 19 00	23 05 00 00	Common Work Results for HVAC
22 11 19 00	22 11 16 00d	Steam And Condensate Piping
22 11 19 00	23 43 00 00	Electronic Air Cleaners
22 11 23 00	22 11 00 00	Gray-Water Piping



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SECTION 22 11 23 13 - DOMESTIC-WATER PACKAGED BOOSTER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Simplex, constant-speed booster pumps.
2. Multiplex, constant-speed booster pumps.
3. Simplex, variable-speed booster pumps.
4. Multiplex, variable-speed booster pumps.

B. Related Requirements:

1. Section 221123 "Domestic Water Pumps" for domestic-water circulation pumps.
2. Section 221223 "Facility Indoor Potable-Water Storage Tanks" for separate hydropneumatic domestic-water tanks for multiplex booster pumps.

1.2 DEFINITIONS

A. PID: Proportional Integral Derivative.

B. VFC: Variable-frequency controller.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For booster pumps.

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For domestic-water packaged booster pumps.

1. Include design calculations for selecting vibration isolators **[and seismic restraints]** and for designing vibration isolation bases.



1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, for booster pumps, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For booster pumps to include in emergency, operation, and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Retain protective coatings and flange's protective covers during storage.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.
- B. Seismic Performance: Booster pumps shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
 - 1. The term "withstand" means "the booster pump will remain in place without separation of any parts from the booster pump when subjected to the seismic forces specified **and the booster pump will be fully operational after the seismic event**."

2.2 SIMPLEX, CONSTANT-SPEED BOOSTER PUMPS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Advanced Mechanical Technologies]**
 - 2. **[AMTROL, Inc.]**
 - 3. **[Armstrong Fluid Technology]**

4. [Bell & Gossett; a Xylem brand]
 5. [Canariis Corporation]
 6. [Delta P Carver]
 7. [Flowtronex; a brand of Motor Controls, Inc.]
 8. [Goulds Water Technology; a Xylem brand]
 9. [GRUNDFOS CBS Inc.]
 10. [Hydronic Modules Company]
 11. [Metropolitan Industries, Inc.]
 12. [PACO Pumps; Grundfos Pumps Corporation, USA]
 13. [Thrush Co. Inc.]
 14. [TIGERFLOW Systems, Inc.]
 15. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Advanced Mechanical Technologies]
 2. [AMTROL, Inc.]
 3. [Armstrong Fluid Technology]
 4. [Bell & Gossett; a Xylem brand]
 5. [Canariis Corporation]
 6. [Delta P Carver]
 7. [Flowtronex; a brand of Motor Controls, Inc.]
 8. [Goulds Water Technology; a Xylem brand]
 9. [GRUNDFOS CBS Inc.]
 10. [Hydronic Modules Company]
 11. [Metropolitan Industries, Inc.]
 12. [PACO Pumps; Grundfos Pumps Corporation, USA]
 13. [Thrush Co. Inc.]
 14. [TIGERFLOW Systems, Inc.]
 15. <Insert manufacturer's name>
- C. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pump, piping, valves, specialties, and controls, and mounted on base.
- D. Pump:
1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, close-coupled, single-stage, overhung-impeller, centrifugal pump.
 2. Casing: Radially split; [bronze][cast iron][stainless steel].
 3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.
 4. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.
 5. Seal: Mechanical.
 6. Orientation: Mounted [horizontally][or][vertically].
- E. Motor: Single speed, with [grease-lubricated][or][pre-greased, permanently shielded], ball-bearings, and directly mounted to pump casing. Select motor that will not overload through full range of pump performance curve.
- F. Piping: [Copper tube and copper fittings][Stainless-steel pipe and fittings][Stainless-steel pipe and fitting headers and copper tube and copper fittings between headers and pump][Galvanized-steel pipe and cast-iron fittings].
- G. Valves:

1. Shutoff Valves NPS 2 (DN 50) and Smaller: **[Gate valve][or][two-piece, full-port ball valve]**, in pump suction and discharge piping.
 2. Shutoff Valves NPS 2-1/2 (DN 65) and Larger: **[Gate valve][or][lug-type butterfly valve]**, in pump suction and discharge piping.
 3. Check Valve NPS 2 (DN 50) and Smaller: **[Silent][or][swing]** type in pump discharge piping.
 4. Check Valve NPS 2-1/2 (DN 65) and Larger: Silent type in pump discharge piping.
 5. Control Valve with Separate Check Valve: Adjustable, automatic, **[pilot-operated][or][direct-acting]**, pressure-reducing type in pump discharge piping.
 6. Control Valve: Combination adjustable, automatic, **[pilot-operated][or][direct-acting]** pressure-reducing-and-check type in pump discharge piping.
 7. Thermal-Relief Valve: Temperature-and-pressure relief type in pump discharge piping.
- H. Dielectric Fittings: With insulating material to isolate joined dissimilar metals.
- I. Hydropneumatic Tank: Precharged[, **ASME-construction,**] diaphragm or bladder tank made of materials complying with NSF 61 and NSF 372.
- J. Control Panel: Factory installed and connected as an integral part of booster pump; automatic for single-pump, constant-speed operation, with load control and protection functions.
1. Control Logic: **[Electromechanical system with switches, relays][Solid-state system with transducers, programmable microprocessor]**, and other devices in the controller.
 2. Motor Controller, General Purpose: NEMA ICS 2, general-purpose, Class A, full-voltage, combination-magnetic type with undervoltage release feature, motor-circuit-protector-type disconnect, and short-circuit protective device.
 - a. Control Voltage: **[24][120]** V ac, with integral control-power transformer.
 3. Motor Controller, Solid State: NEMA ICS 2, solid-state, reduced-voltage type.
 - a. Control Voltage: **[24][120]** V ac, with integral control-power transformer.
 4. Enclosure: NEMA 250, **[Type 1][Type 3R][Type 4][Type 12]<Insert type>**.
 5. Motor Overload Protection: Overload relay in each phase.
 6. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
 7. Pump Operation: **[Current-][or][pressure-]**sensing method.
 - a. Time Delay: Controls pump on-off operation; adjustable from **[1 to 300]<Insert number(s)>** seconds.
 8. Instrumentation: Suction and discharge pressure gauges.
 9. Light: Running light for pump.
 10. Thermal-bleed cutoff.
 11. **[Low-suction-pressure][Water-storage-tank, low-level]** cutout.
 12. High-suction-pressure cutout.
 13. Low-discharge-pressure cutout.
 14. High-discharge-pressure cutout.
 15. Direct Digital Control (DDC) System for HVAC: Provide auxiliary contacts for interface to **[BACnet][LonWorks]<Insert system>** DDC system. DDC systems are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." Include the following:
 - a. On-off status of pump.
 - b. Alarm status.

- K. Base: Structural steel.
- L. Capacities and Characteristics:
1. Minimum Pressure Rating: [125 (860)][150 (1035)]<Insert number> psig (kPa).
 2. Booster-Pump Capacity: <Insert number> gpm (L/s).
 3. Total Dynamic Head: <Insert number> feet (kPa).
 4. Speed: <Insert number> rpm.
 5. Minimum Inlet Pressure: <Insert number> psig (kPa).
 6. Maximum Inlet Pressure: <Insert number> psig (kPa).
 7. Discharge Pressure: <Insert number> psig (kPa).
 8. Low-Suction-Pressure Shutoff: <Insert number> psig (kPa).
 9. High-Suction-Pressure Shutoff: <Insert number> psig (kPa).
 10. Low-Discharge-Pressure Shutoff: <Insert number> psig (kPa).
 11. High-Discharge-Pressure Shutoff: <Insert number> psig (kPa).
 12. Inlet Size: <Insert number> NPS (DN).
 13. Outlet Size: <Insert number> NPS (DN).
 14. Control Valve:
 - a. Minimum Size: <Insert number> NPS (DN).
 - b. Maximum Pressure Drop: <Insert number> psig (kPa).
15. Electrical Characteristics:
- a. Motor Horsepower: <Insert number>.
 - b. Volts: [120][240][277][480]<Insert number> V.
 - c. Phases: [Single][Three].
 - d. Hertz: 60 <Insert number> Hz.
 - e. Full-Load Amperes: <Insert number> A.
 - f. Minimum Circuit Ampacity: <Insert number> A.
 - g. Maximum Overcurrent Protection: <Insert number> A.
16. Hydropneumatic Tank:
- a. Minimum Water Volume Capacity: <Insert number> gal. (L).
 - b. Pressure Rating: [125 (860)][150 (1035)][250 (1725)]<Insert number>psig (kPa).
 - c. Air Precharge: <Insert number> psig (kPa).

2.3 MULTIPLEX, CONSTANT-SPEED BOOSTER PUMPS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Advanced Mechanical Technologies]
 2. [Armstrong Fluid Technology]
 3. [Bell & Gossett; a Xylem brand]
 4. [Canariis Corporation]
 5. [Flowtronex; a brand of Motor Controls, Inc.]
 6. [Goulds Water Technology; a Xylem brand]
 7. [GRUNDFOS CBS Inc.]
 8. [Hydronic Modules Company]
 9. [Metropolitan Industries, Inc]
 10. [PACO Pumps; Grundfos Pumps Corporation, USA]
 11. [Patterson Pump Company; a Gorman-Rupp company]

12. [SyncroFlo, Inc.]
13. [Thrush Co. Inc.]
14. [TIGERFLOW Systems, Inc.]
15. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Advanced Mechanical Technologies]
2. [Armstrong Fluid Technology]
3. [Bell & Gossett; a Xylem brand]
4. [Canariis Corporation]
5. [Flowtronex; a brand of Motor Controls, Inc.]
6. [Goulds Water Technology; a Xylem brand]
7. [GRUNDFOS CBS Inc.]
8. [Hydronic Modules Company]
9. [Metropolitan Industries, Inc]
10. [PACO Pumps; Grundfos Pumps Corporation, USA]
11. [Patterson Pump Company; a Gorman-Rupp company]
12. [SyncroFlo, Inc.]
13. [Thrush Co. Inc.]
14. [TIGERFLOW Systems, Inc.]
15. <Insert manufacturer's name>

C. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties, and controls, and mounted on base.

D. Pumps, End Suction, Close Coupled:

1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, close-coupled, single-stage, overhung-impeller, centrifugal pump.
2. Casing: Radially split; [bronze][cast iron][stainless steel].
3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.
4. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.
5. Seal: Mechanical.
6. Orientation: Mounted [horizontally][or][vertically].

E. Pumps, End Suction, Frame Mounted, Separately Coupled:

1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, frame-mounted, separately coupled, single-stage, overhung-impeller, centrifugal pump. [Include back-pullout design.]
2. Casing: Radially split; [bronze][cast iron][stainless steel].
3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.
4. Shaft and Shaft Sleeve: Stainless steel [or steel] shaft, with copper-alloy shaft sleeve and deflector.
5. Seal: Mechanical.
6. Bearing: [Grease-lubricated][or][pre-greased, permanently shielded] ball type.
7. Coupling: Flexible, with metal guard.

F. Pumps, In Line, Single Stage:

1. Type: In line, single stage as defined in HI 1.1-1.2 and HI 1.3 for in-line, single-stage, close-coupled, overhung-impeller, centrifugal pump.

2. Casing: Radially split; **[bronze][cast iron][stainless steel]**.
 3. Impeller: Closed, **[ASTM B584 cast bronze][stainless steel]<Insert material>**; statically and dynamically balanced and keyed to shaft.
 4. Shaft and Shaft Sleeve: Stainless-steel **[or steel]** shaft, with copper-alloy shaft sleeve.
 5. Seal: Mechanical.
 6. Bearing: **[Grease-lubricated][or][pre-greased, permanently shielded]** ball type.
- G. Pumps, Vertical, Multistage:
1. Type: Vertical, multistage as defined in HI 1.1-1.2 and HI 1.3 for in-line, multistage, separately coupled, overhung-impeller, centrifugal pump.
 2. Casing: Cast-iron or steel base and stainless-steel chamber.
 3. Impeller: Closed, stainless steel; statically and dynamically balanced and keyed to shaft.
 4. Shaft: Stainless steel.
 5. Seal: Mechanical.
 6. Bearing: Water-lubricated sleeve type.
- H. Pumps, Vertical, Can:
1. Type: Vertical, can, as defined in HI 2.1-2.2 and HI 2.3 for in-line, barrel or can, lineshaft, vertical pump.
 2. Impeller: Closed, stainless steel; statically and dynamically balanced and keyed to shaft.
 3. Bowls: **[Epoxy-coated cast iron][Cast iron]<Insert material>**.
 4. Shaft: Stainless steel.
 5. Seals: Mechanical and stuffing-box types.
 6. Bearings: Water-lubricated bushing type.
- I. Motors: Single speed, with **[grease-lubricated][or][pre-greased, permanently shielded]**, ball-bearings. Select motors that will not overload through full range of pump performance curve.
- J. Piping: **[Copper tube and copper fittings][Stainless-steel pipe and fittings][Stainless-steel pipe and fitting headers and copper tube and copper fittings between headers and pump][Galvanized-steel pipe and cast-iron fittings]**.
- K. Valves:
1. Shutoff Valves NPS 2 (DN 50) and Smaller: **[Gate valve][or][two-piece, full-port ball valve]**, in each pump's suction and discharge piping.
 2. Shutoff Valves NPS 2-1/2 (DN 65) and Larger: **[Gate valve][or][lug-type butterfly valve]**, in each pump's suction and discharge piping **[and in inlet and outlet headers]**.
 3. Check Valves NPS 2 (DN 50) and Smaller: **[Silent][or][swing]** type in each pump's discharge piping.
 4. Check Valves NPS 2-1/2 (DN 65) and Larger: Silent type in each pump's discharge piping.
 5. Control Valves with Separate Check Valve: Adjustable, automatic, **[pilot-operated][or][direct-acting]**, pressure-reducing type in each pump's discharge piping.
 6. Control Valves: Combination adjustable, automatic, **[pilot-operated][or][direct-acting]** pressure-reducing-and-check type in each pump's discharge piping.
 7. Thermal-Relief Valve: Temperature-and-pressure relief type in pump's discharge header piping.
- L. Dielectric Fittings: With insulating material to isolate joined dissimilar metals.
- M. Control Panel: Factory installed and connected as an integral part of booster pump; automatic for multiple-pump, constant-speed operation, with load control and protection functions.
1. Control Logic: **[Electromechanical system with switches, relays][Solid-state system with transducers, programmable microprocessor]**, and other devices in the controller.

2. Motor Controller, General Purpose: NEMA ICS 2, general-purpose, Class A, full-voltage, combination-magnetic type with undervoltage release feature, motor-circuit-protector-type disconnect, and short-circuit protective device.
 - a. Control Voltage: [24][120] V ac, with integral control-power transformer.
 3. Motor Controller, Solid State: NEMA ICS 2, solid-state, reduced-voltage type.
 - a. Control Voltage: [24][120] V ac, with integral control-power transformer.
 4. Enclosure: NEMA 250, [Type 1][Type 3R][Type 4][Type 12]<Insert type>.
 5. Motor Overload Protection: Overload relay in each phase.
 6. Starting Devices: Hand-off-automatic selector switch for each pump in cover of control panel, plus pilot device for automatic control.
 - a. Duplex, Automatic, Alternating Starter: Switches lead pump to lag main pump and to two-pump operation.
 - b. Triplex, Sequence (Lead-Lag-Lag) Starter: Switches lead pump to one lag main pump and to three-pump operation.
 7. Pump Operation and Sequencing: [Current-][or][pressure-]sensing method.
 - a. Time Delay: Controls pump on-off operation; adjustable from [1 to 300]<Insert number(s)> seconds.
 8. Instrumentation: Suction and discharge pressure gauges.
 9. Lights: Running light for each pump.
 10. Alarm Signal Device: Sounds alarm when backup pumps are operating.
 - a. Time Delay: Controls alarm operation; adjustable from [1 to 300]<Insert number(s)> seconds, with [automatic][manual] reset.
 11. Thermal-bleed cutoff.
 12. [Low-suction-pressure][Water-storage-tank, low-level] cutout.
 13. High-suction-pressure cutout.
 14. Low-discharge-pressure cutout.
 15. High-discharge-pressure cutout.
 16. Direct Digital Control (DDC) System for HVAC: Provide auxiliary contacts for interface to [BACnet][LonWorks]<Insert system> DDC system. DDC systems are specified in Section 230923 "Direct-Digital Control (DDC) System for HVAC." Include the following:
 - a. On-off status of each pump.
 - b. Alarm status.
- N. Base: Structural steel.
- O. Capacities and Characteristics:
1. Minimum Pressure Rating: [150 (1035)][250 (1725)]<Insert number> psig (kPa).
 2. Booster-Pump Capacity: <Insert number> gpm (L/s).
 3. Minimum Inlet Pressure: <Insert number> psig (kPa).
 4. Maximum Inlet Pressure: <Insert number> psig (kPa).
 5. Discharge Pressure: <Insert number> psig (kPa).
 6. Low-Suction-Pressure Shutoff: <Insert number> psig (kPa).
 7. High-Suction-Pressure Shutoff: <Insert number> psig (kPa).

8. Low-Discharge-Pressure Shutoff: <Insert number> psig (kPa).
9. High-Discharge-Pressure Shutoff: <Insert number> psig (kPa).
10. Header Size: <Insert number> NPS (DN).
11. Lead Pump:
 - a. Capacity: <Insert number> gpm (L/s).
 - b. Total Dynamic Head: <Insert number> feet (kPa).
 - c. Speed: <Insert number> rpm.
 - d. Control Valve:
 - 1) Minimum Size: <Insert number> NPS (DN).
 - 2) Maximum Pressure Drop: <Insert number> psig (kPa).
 - e. Electrical Characteristics:
 - 1) Motor Horsepower: <Insert number>.
 - 2) Volts: [120][240][277][480]<Insert number> V.
 - 3) Phases: [Single][Three].
 - 4) Hertz: 60 <Insert number> Hz.
12. Each of [Two]<Insert number> Lag Pumps:
 - a. Capacity: <Insert number> gpm (L/s).
 - b. Total Dynamic Head: <Insert number> feet (kPa).
 - c. Speed: <Insert number> rpm.
 - d. Control Valve:
 - 1) Minimum Size: <Insert number> NPS (DN).
 - 2) Maximum Pressure Drop: <Insert number> psig (kPa).
 - e. Electrical Characteristics:
 - 1) Motor Horsepower: <Insert number>.
 - 2) Volts: [120][240][277][480]<Insert number> V.
 - 3) Phases: [Single][Three].
 - 4) Hertz: 60 <Insert number> Hz.
13. Booster-Pump Electrical Characteristics:
 - a. Full-Load Amperes: <Insert number> A.
 - b. Minimum Circuit Ampacity: <Insert number> A.
 - c. Maximum Overcurrent Protection: <Insert number> A.

2.4 SIMPLEX, VARIABLE-SPEED BOOSTER PUMPS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Advanced Mechanical Technologies]
 2. [Canariis Corporation]
 3. [Delta P Carver]
 4. [Flowtronex; a brand of Motor Controls, Inc.]
 5. [GRUNDFOS CBS Inc.]
 6. [Hydronic Modules Company]

7. [QuantumFlo, Inc.]
 8. [TIGERFLOW Systems, Inc.]
 9. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Advanced Mechanical Technologies]
 2. [Canariis Corporation]
 3. [Delta P Carver]
 4. [Flowtronex; a brand of Motor Controls, Inc.]
 5. [GRUNDFOS CBS Inc.]
 6. [Hydronic Modules Company]
 7. [QuantumFlo, Inc.]
 8. [TIGERFLOW Systems, Inc.]
 9. <Insert manufacturer's name>
- C. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pump, piping, valves, specialties, and controls, and mounted on base.
- D. Pump:
1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, close-coupled, single-stage, overhung-impeller, centrifugal pump.
 2. Casing: Radially split; [bronze][cast iron][stainless steel].
 3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.
 4. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.
 5. Seal: Mechanical.
 6. Orientation: Mounted [horizontally][or][vertically].
- E. Motor: Single speed, with [grease-lubricated][or][pre-greased, permanently shielded], ball-bearings, and directly mounted to pump casing. Select motor that will not overload through full range of pump performance curve.
- F. Piping: [Copper tube and copper fittings][Stainless-steel pipe and fittings][Stainless-steel pipe and fitting headers and copper tube and copper fittings between headers and pump][Galvanized-steel pipe and cast-iron fittings].
- G. Valves:
1. Shutoff Valves NPS 2 (DN 50) and Smaller: [Gate valve][or][two-piece, full-port ball valve], in pump suction and discharge piping.
 2. Shutoff Valves NPS 2-1/2 (DN 65) and Larger: [Gate valve][or][lug-type butterfly valve], in pump suction and discharge piping.
 3. Check Valve NPS 2 (DN 50) and Smaller: [Silent][or][swing] type in pump discharge piping.
 4. Check Valve NPS 2-1/2 (DN 65) and Larger: Silent type in pump discharge piping.
 5. Thermal-Relief Valve: Temperature-and-pressure relief type in pump discharge piping.
- H. Dielectric Fittings: With insulating material to isolate joined dissimilar metals.
- I. Hydropneumatic Tank: Precharged[, ASME-construction,] diaphragm or bladder tank made of materials complying with NSF 61 and NSF 372.
- J. VFC Specified in Other Section: Comply with Section 262923 "Variable-Frequency Motor Controllers."

K. VFC: Serving each pump in pump array.

1. Manufactured Units: Pulse-width modulated; **[constant torque][and][variable torque]<Insert application>** for **[Design A and Design B][inverter-duty]** motors.
2. Output Rating: Three phase; 10 to **[60 Hz, with voltage proportional to frequency throughout voltage range][66 Hz, with torque constant as speed changes]**; maximum voltage equals input voltage.
3. Unit Operating Requirements:
 - a. Internal Adjustability:
 - 1) Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2) Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3) Acceleration: **[0.1 to 999.9]<Insert range>** seconds.
 - 4) Deceleration: **[0.1 to 999.9]<Insert range>** seconds.
 - 5) Current Limit: 30 to minimum of 150 percent of maximum rating.
 - b. Self-Protection and Reliability Features:
 - 1) Surge suppression.
 - 2) Loss of input signal protection.
 - 3) Under- and overvoltage trips.
 - 4) VFC and motor overload/overtemperature protection.
 - 5) Critical frequency rejection.
 - 6) Loss-of-phase protection.
 - 7) Reverse-phase protection.
 - 8) Motor-overtemperature fault.
 - c. Bidirectional autospeed search.
 - d. Torque boost.
 - e. Motor temperature compensation at slow speeds.
 - 1) Panel-mounted operator station.
 - 2) Historical logging information and displays.
 - 3) Digital indicating devices.
 - f. Control Signal Interface: Electric.
 - g. PID control interface.
 - h. DDC System for HVAC Protocols for Network Communications: **[ASHRAE 135]<Insert protocol type>**.
4. Line Conditioning:
 - a. Input line conditioning.
 - b. Output filtering.
 - c. EMI/RFI filtering.
5. Bypass Systems:
 - a. Bypass Mode: **[Manual operation only][Field-selectable automatic or manual]**.
 - b. Bypass Controller:
 - 1) Two-contactor style, with bypass and output isolating contactors[**and isolating switch**].
 - 2) Three-contactor style, with bypass and input and output isolating contactors[**and isolating switch**].

- c. Bypass Contactor Configuration: **[Full-voltage (across the line)][Reduced-voltage (autotransformer)]<Insert type> type.**

6. Instrumentation: Suction and discharge pressure gauges.
7. Light: Running light for pump.
8. Thermal-bleed cutoff.
9. **[Low-suction-pressure][Water-storage-tank, low-level]** cutout.
10. High-suction-pressure cutout.
11. Low-discharge-pressure cutout.
12. High-discharge-pressure cutout.
13. Direct Digital Control (DDC) System for HVAC: Provide auxiliary contacts for interface to **[BACnet][LonWorks]<Insert system>** DDC system. DDC systems are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." Include the following:
 - a. On-off status of each pump.
 - b. Alarm status.

L. Base: Structural steel.

M. Capacities and Characteristics:

1. Minimum Pressure Rating: **[125 (860)][150 (1035)]<Insert number> psig (kPa).**
2. Booster-Pump Capacity: **<Insert number> gpm (L/s).**
3. Total Dynamic Head: **<Insert number> feet (kPa).**
4. Speed: **<Insert rpm>.**
5. Minimum Inlet Pressure: **<Insert number> psig (kPa).**
6. Maximum Inlet Pressure: **<Insert number> psig (kPa).**
7. Discharge Pressure: **<Insert number> psig (kPa).**
8. Low-Suction-Pressure Shutoff: **<Insert number> psig (kPa).**
9. High-Suction-Pressure Shutoff: **<Insert number> psig (kPa).**
10. Low-Discharge-Pressure Shutoff: **<Insert number> psig (kPa).**
11. High-Discharge-Pressure Shutoff: **<Insert number> psig (kPa).**
12. Inlet Size: **<Insert number> NPS (DN).**
13. Outlet Size: **<Insert number> NPS (DN).**
14. Electrical Characteristics:
 - a. Motor Horsepower: **<Insert number>.**
 - b. Volts: **[120][240][277][480]<Insert number> V.**
 - c. Phases: **[Single][Three].**
 - d. Hertz: **60 <Insert number> Hz.**
 - e. Full-Load Amperes: **<Insert number> A.**
 - f. Minimum Circuit Ampacity: **<Insert number> A.**
 - g. Maximum Overcurrent Protection: **<Insert number> A.**
15. Hydropneumatic Tank:
 - a. Minimum Water Volume Capacity: **<Insert number> gal. (L).**
 - b. Pressure Rating: **[125 (860)][150 (1035)][250 (1725)]<Insert number> psig (kPa).**
 - c. Air Precharge: **<Insert number> psig (kPa).**

2.5 MULTIPLEX, VARIABLE-SPEED BOOSTER PUMPS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be**

incorporated into the Work include, but are not limited to, the following]:

1. [Advanced Mechanical Technologies]
2. [Armstrong Fluid Technology]
3. [Bell & Gossett; a Xylem brand]
4. [Canariis Corporation]
5. [Delta P Carver]
6. [Flo Fab Inc]
7. [Flowtronex; a brand of Motor Controls, Inc.]
8. [Goulds Water Technology; a Xylem brand]
9. [GRUNDFOS CBS Inc.]
10. [Patterson Pump Company; a Gorman-Rupp company]
11. [QuantumFlo, Inc.]
12. [SyncroFlo, Inc.]
13. [TIGERFLOW Systems, Inc.]
14. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Advanced Mechanical Technologies]
2. [Armstrong Fluid Technology]
3. [Bell & Gossett; a Xylem brand]
4. [Canariis Corporation]
5. [Delta P Carver]
6. [Flo Fab Inc]
7. [Flowtronex; a brand of Motor Controls, Inc.]
8. [Goulds Water Technology; a Xylem brand]
9. [GRUNDFOS CBS Inc.]
10. [Patterson Pump Company; a Gorman-Rupp company]
11. [QuantumFlo, Inc.]
12. [SyncroFlo, Inc.]
13. [TIGERFLOW Systems, Inc.]
14. <Insert manufacturer's name>

- C. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties, and controls, and mounted on base.

- D. Pumps, End Suction, Close Coupled:

1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, close-coupled, single-stage, overhung-impeller, centrifugal pump.
2. Casing: Radially split; [bronze][cast iron][stainless steel].
3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.
4. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.
5. Seal: Mechanical.
6. Orientation: Mounted [horizontally][or][vertically].

- E. Pumps, End Suction, Frame Mounted, Separately Coupled:

1. Type: End suction as defined in HI 1.1-1.2 and HI 1.3 for end-suction, frame-mounted, separately coupled, single-stage, overhung-impeller, centrifugal pump. [Include back-pullout design.]
2. Casing: Radially split; [bronze][cast iron][stainless steel].
3. Impeller: Closed, [ASTM B584 cast bronze][stainless steel]<Insert material>; statically and dynamically balanced and keyed to shaft.

4. Shaft and Shaft Sleeve: Stainless steel[**or steel**] shaft, with copper-alloy shaft sleeve and deflector.
5. Seal: Mechanical.
6. Bearing: [**Grease-lubricated**][or][**pre-greased, permanently shielded**] ball type.
7. Coupling: Flexible, with metal guard.

F. Pumps, In Line, Single Stage:

1. Type: In line, single stage as defined in HI 1.1-1.2 and HI 1.3 for in-line, single-stage, close-coupled, overhung-impeller, centrifugal pump.
2. Casing: Radially split; [**bronze**][**cast iron**][**stainless steel**].
3. Impeller: Closed, [**ASTM B584 cast bronze**][**stainless steel**]**<Insert material>**; statically and dynamically balanced and keyed to shaft.
4. Shaft and Shaft Sleeve: Stainless-steel[**or steel**] shaft, with copper-alloy shaft sleeve.
5. Seal: Mechanical.
6. Bearing: [**Grease-lubricated**][or][**pre-greased, permanently shielded**] ball type.

G. Pumps, Vertical, Multistage:

1. Type: Vertical, multistage as defined in HI 1.1-1.2 and HI 1.3 for in-line, multistage, separately coupled, overhung-impeller, centrifugal pump.
2. Casing: Cast-iron or steel base and stainless-steel chamber.
3. Impeller: Closed, stainless steel; statically and dynamically balanced and keyed to shaft.
4. Shaft: Stainless steel.
5. Seal: Mechanical.
6. Bearing: Water-lubricated sleeve type.

H. Pumps, Vertical, Can:

1. Type: Vertical, can, as defined in HI 2.1-2.2 and HI 2.3 for in-line, barrel or can, lineshaft, vertical pump.
2. Impeller: Closed, stainless steel; statically and dynamically balanced and keyed to shaft.
3. Bowls: [**Epoxy-coated cast iron**][**Cast iron**]**<Insert material>**.
4. Shaft: Stainless steel.
5. Seals: Mechanical and stuffing-box types.
6. Bearings: Water-lubricated bushing type.

I. Motors: Single speed, with [**grease-lubricated**][or][**pre-greased, permanently shielded**], ball-bearings. Select motors that will not overload through full range of pump performance curve.

J. Piping: [**Copper tube and copper fittings**][**Stainless-steel pipe and fittings**][**Stainless-steel pipe and fitting headers and copper tube and copper fittings between headers and pump**][**Galvanized-steel pipe and cast-iron fittings**].

K. Valves:

1. Shutoff Valves **NPS 2 (DN 50)** and Smaller: [**Gate valve**][or][**two-piece, full-port ball valve**], in each pump's suction and discharge piping.
2. Shutoff Valves **NPS 2-1/2 (DN 65)** and Larger: [**Gate valve**][or][**lug-type butterfly valve**], in each pump's suction and discharge piping[**and in inlet and outlet headers**].
3. Check Valves **NPS 2 (DN 50)** and Smaller: [**Silent**][or][**swing**] type in each pump's discharge piping.
4. Check Valves **NPS 2-1/2 (DN 65)** and Larger: Silent type in each pump's discharge piping.
5. Thermal-Relief Valve: Temperature-and-pressure relief type in pump's discharge header piping.

- L. Dielectric Fittings: With insulating material to isolate joined dissimilar metals.
- M. VFC Specified in Other Section: Comply with Section 262923 "Variable-Frequency Motor Controllers."
- N. VFC: Serving each pump in pump array.
 - 1. Manufactured Units: Pulse-width modulated; **[constant torque][and][variable torque]<Insert application>** for **[Design A and Design B][inverter-duty]** motors.
 - 2. Output Rating: Three phase; 10 to **[60 Hz, with voltage proportional to frequency throughout voltage range][66 Hz, with torque constant as speed changes]**; maximum voltage equals input voltage.
 - 3. Unit Operating Requirements:
 - a. Internal Adjustability:
 - 1) Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2) Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3) Acceleration: **[0.1 to 999.9]<Insert range>** seconds.
 - 4) Deceleration: **[0.1 to 999.9]<Insert range>** seconds.
 - 5) Current Limit: 30 to minimum of 150 percent of maximum rating.
 - b. Self-Protection and Reliability Features:
 - 1) Surge suppression.
 - 2) Loss of input signal protection.
 - 3) Under- and overvoltage trips.
 - 4) VFC and motor overload/overtemperature protection.
 - 5) Critical frequency rejection.
 - 6) Loss-of-phase protection.
 - 7) Reverse-phase protection.
 - 8) Motor-overtemperature fault.
 - c. Bidirectional autospeed search.
 - d. Torque boost.
 - e. Motor temperature compensation at slow speeds.
 - 1) Panel-mounted operator station.
 - 2) Historical logging information and displays.
 - 3) Digital indicating devices.
 - f. Control Signal Interface: Electric.
 - g. Proportional Integral Derivative (PID) control interface.
 - h. DDC System for HVAC Protocols for Network Communications: **[ASHRAE 135]<Insert protocol type>**.
 - 4. Line Conditioning:
 - a. Input line conditioning.
 - b. Output filtering.
 - c. EMI/RFI filtering.
 - 5. Bypass Systems:
 - a. Bypass Mode: **[Manual operation only][Field-selectable automatic or manual]**.
 - b. Bypass Controller:

- 1) Two-contactor style, with bypass and output isolating contactors[**and isolating switch**].
 - 2) Three-contactor style, with bypass and input and output isolating contactors[**and isolating switch**].
- c. Bypass Contactor Configuration: **[Full-voltage (across the line)][Reduced-voltage (autotransformer)]<Insert type>** type.
6. Instrumentation: Suction and discharge pressure gauges.
 7. Lights: Running light for each pump.
 8. Alarm Signal Device: Sounds alarm when backup pumps are operating.
 - a. Time Delay: Controls alarm operation; adjustable from **[1 to 300]<Insert number(s)>** seconds, with **[automatic][manual]** reset.
 9. Thermal-bleed cutoff.
 10. **[Low-suction-pressure][Water-storage-tank, low-level]** cutout.
 11. High-suction-pressure cutout.
 12. Low-discharge-pressure cutout.
 13. High-discharge-pressure cutout.
 14. Direct Digital Control (DDC) System for HVAC: Provide auxiliary contacts for interface to **[BACnet][LonWorks]<Insert system>** DDC system. DDC systems are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." Include the following:
 - a. On-off status of each pump.
 - b. Alarm status.
- O. Base: Structural steel.
- P. Capacities and Characteristics:
1. Minimum Pressure Rating: **[150 (1035)][250 (1725)]<Insert number> psig (kPa)**.
 2. Booster-Pump Capacity: **<Insert number> gpm (L/s)**.
 3. Minimum Inlet Pressure: **<Insert number> psig (kPa)**.
 4. Maximum Inlet Pressure: **<Insert number> psig (kPa)**.
 5. Discharge Pressure: **<Insert number> psig (kPa)**.
 6. Low-Suction-Pressure Shutoff: **<Insert number> psig (kPa)**.
 7. High-Suction-Pressure Shutoff: **<Insert number> psig (kPa)**.
 8. Low-Discharge-Pressure Shutoff: **<Insert number> psig (kPa)**.
 9. High-Discharge-Pressure Shutoff: **<Insert number> psig (kPa)**.
 10. Header Size: **<Insert number> NPS (DN)**.
 11. Lead Pump:
 - a. Capacity: **<Insert number> gpm (L/s)**.
 - b. Total Dynamic Head: **<Insert number> feet (kPa)**.
 - c. Speed: **<Insert number> rpm**.
 - d. Electrical Characteristics:
 - 1) Motor Horsepower: **<Insert number>**.
 - 2) Volts: **[120][240][277][480]<Insert number> V**.
 - 3) Phases: **[Single][Three]**.
 - 4) Hertz: **60 <Insert number> Hz**.
 12. Each of **[Two]<Insert number>** Lag Pumps:

- a. Capacity: <Insert number> gpm (L/s).
- b. Total Dynamic Head: <Insert number> feet (kPa).
- c. Speed: <Insert number> rpm.
- d. Electrical Characteristics:
 - 1) Motor Horsepower: <Insert number>.
 - 2) Volts: [120][240][277][480]<Insert number> V.
 - 3) Phases: [Single][Three].
 - 4) Hertz: 60 <Insert number> Hz.

13. Booster-Pump Electrical Characteristics:

- a. Full-Load Amperes: <Insert number> A.
- b. Minimum Circuit Ampacity: <Insert number> A.
- c. Maximum Overcurrent Protection: <Insert number> A.

2.6 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in NFPA 70.

2.7 SOURCE QUALITY CONTROL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. ASME Compliance: Comply with ASME B31.9 for piping.
- C. UL Compliance for Packaged Pumping Systems:
 - 1. UL 508, "Industrial Control Equipment."
 - 2. UL 508A, "Industrial Control Panels."
 - 3. UL 778, "Motor-Operated Water Pumps."
 - 4. UL 1995, "Heating and Cooling Equipment."
- D. Booster pumps shall be listed and labeled as packaged pumping systems by testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for booster pumps to verify actual locations of piping connections before booster-pump installation.

3.2 INSTALLATION

A. Booster-Pump Mounting:

1. Install booster pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
3. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Support connected domestic-water piping so weight of piping is not supported by booster pumps.

3.3 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Booster-Pump Piping Connections: Connect domestic-water piping to booster pumps. Install suction and discharge pipe equal to or greater than size of system suction and discharge **[headers][piping]**.

1. Install shutoff valves on piping connections to booster-pump suction and discharge **[headers][piping]**. Install ball, butterfly, or gate valves same size as suction and discharge **[headers][piping]**. Comply with requirements for general-duty valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Install union, flanged, or grooved-joint connections on suction and discharge **[headers][piping]** at connection to domestic-water piping. Comply with requirements for unions and flanges specified in Section 221116 "Domestic Water Piping."
3. Install valved bypass, same size as and between piping, at connections to booster-pump suction and discharge **[headers][piping]**. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
4. Install flexible connectors, same size as piping, on piping connections to booster-pump suction and discharge **[headers][piping]**. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
5. Where installing piping adjacent to booster pumps, allow space for service and maintenance.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.6 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least **1/2 inch (13 mm)** high.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].
 - 1. Perform visual and mechanical inspection.
 - 2. Leak Test: After installation, charge booster pump and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster-pump operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.8 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. **<Insert startup steps if any>**.

3.9 ADJUSTING

- A. Adjust booster pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust pressure set points.
- C. Occupancy Adjustments: When requested within **[12]<Insert number>** months of date of Substantial Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions.



Provide up to [two]<Insert number> visits to Project during other-than-normal occupancy hours for this purpose.

3.10 DEMONSTRATION

- A. [Engage a factory-authorized service representative to train][Train] Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

END OF SECTION 22 11 23 13



Task	Specification	Specification Description
22 11 23 13	22 11 00 00	Gray-Water Piping



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SECTION 22 11 23 23 - INLINE, DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.
2. Horizontally mounted, in-line, separately coupled centrifugal pumps.
3. Horizontally mounted, in-line, close-coupled centrifugal pumps.
4. Vertically mounted, in-line, close-coupled centrifugal pumps.

B. Related Requirements:

1. Section 221123.13 "Domestic-Water Packaged Booster Pumps" for booster systems.
2. Section 331113 "Potable Water Supply Wells" for well pumps.

1.2 ACTION SUBMITTALS

- A. Product Data Submittals:** For each product. Include construction materials, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For pump controls.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:** Detail pumps and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which pumps will be attached.
2. Size and location of initial access modules for acoustical tile.

- B. Seismic Qualification Data:** Certificates, for inline, domestic-water pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- C. Field quality-control reports.**

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For inline, domestic-water pumps to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: UL 778 for motor-operated water pumps.
- C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.
- D. **<Insert local jurisdiction requirement>.**
- E. Seismic Performance: Inline, domestic-water pumps shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>.**
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
 - 2. Component Importance Factor: **[1.5][1.0]**.
 - 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>.**

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Flo Fab Inc]**
 - 2. **[GRUNDFOS CBS Inc.]**
 - 3. **[Taco Comfort Solutions]**
 - 4. **[WILO USA LLC - WILO Canada Inc.]**
 - 5. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's**

name; product name or designation> or comparable product by one of the following:

1. **[Flo Fab Inc]**
2. **[GRUNDFOS CBS Inc.]**
3. **[Taco Comfort Solutions]**
4. **[WILO USA LLC - WILO Canada Inc.]**
5. **<Insert manufacturer's name>**

C. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

D. Capacities and Characteristics:

1. Capacity: **<Insert gpm (L/s)>**.
2. Total Dynamic Head: **<Insert feet (kPa)>**.
3. Inlet and Outlet Size: **<Insert NPS (DN)>**.
4. Pump Speed: **<Insert rpm>**.
5. Pump Control: **[Pressure switch][Thermostat][Timer]**.
6. Motor Horsepower: **<Insert value> HP**.
7. Electrical Characteristics:
 - a. Volts: **[120]<Insert number> V**.
 - b. Phase: **[Single]<Insert number> phase**.
 - c. Hertz: **[60]<Insert number> Hz**.
 - d. Full-Load Amperes: **<Insert value> A**.
 - e. Minimum Circuit Ampacity: **<Insert number> A**.
 - f. Maximum Overcurrent Protection: **<Insert number> A**.

E. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Minimum Working Pressure: **[125 psig (860 kPa)]<Insert pressure>**.
3. Maximum Continuous Operating Temperature: **[220 deg F (104 deg C)]<Insert temperature>**.
4. Casing: **[Cast iron][Bronze][Stainless steel]**, with threaded or companion-flange connections.
5. Impeller: **[Plastic][composite][or][stainless steel]**.
6. Motor: **[Single][Three]** speed.
7. **<Insert options>**.

2.3 HORIZONTALLY MOUNTED, IN-LINE, SEPARATELY COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Bell & Gossett; a Xylem brand]**
2. **[MEPCO, LLC.]**
3. **[Taco Comfort Solutions]**
4. **[Thrush Co. Inc.]**
5. **<Insert manufacturer's name>**

B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Bell & Gossett; a Xylem brand]**

2. [MEPCO, LLC.]
3. [Taco Comfort Solutions]
4. [Thrush Co. Inc.]
5. <Insert manufacturer's name>

C. Description: Factory-assembled and -tested, in-line, single-stage, separately coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shafts mounted horizontal.

D. Capacities and Characteristics:

1. Capacity: <Insert gpm (L/s)>.
2. Total Dynamic Head: <Insert feet (kPa)>.
3. Inlet and Outlet Size: <Insert NPS (DN)>.
4. Pump Speed: <Insert rpm>.
5. Pump Control: [Pressure switch][Thermostat][Timer].
6. Motor Horsepower: <Insert value>.
7. Electrical Characteristics:
 - a. Volts: [120][240]<Insert number> V.
 - b. Phases: [Single][Three] phase.
 - c. Hertz: [60]<Insert number> Hz.
 - d. Full-Load Amperes: <Insert number> A.
 - e. Minimum Circuit Ampacity: <Insert number> A.
 - f. Maximum Overcurrent Protection: <Insert number> A.

E. Pump Construction:

1. Casing:
 - a. Radially split [bronze][cast iron][or][stainless steel] with threaded companion-flange connections for pumps with **NPS 2 (DN 50)** pipe connections and flanged connections for pumps with **NPS 2-1/2 (DN 65)** pipe connections.
 - b. Built to permit servicing of pump internals without disturbing the casing or the suction and discharge piping.
 - c. Gauge port tapings at suction and discharge nozzles.
2. Impeller: [Bronze][or][stainless steel], statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
4. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
5. Seal: Mechanical, with [carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket]<Insert seal type>.
6. Bearings: [Grease-lubricated][or][permanently lubricated] ball type.
7. Minimum Working Pressure: [125 psig (860 kPa)][175 psig (1200 kPa)]<Insert pressure>.
8. Continuous Operating Temperature: [200 deg F (93 deg C)]<Insert temperature>.

F. Motor: Single speed, with permanently lubricated ball bearings; and [resiliently][or][rigidly] mounted to pump casing.

2.4 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Alyan Pump Company]
 2. [Bell & Gossett; a Xylem brand]
 3. [MEPCO, LLC.]
 4. [Pentair Aurora; Pentair Pump Group]
 5. [Taco Comfort Solutions]
 6. [Thrush Co. Inc.]
 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Alyan Pump Company]
 2. [Bell & Gossett; a Xylem brand]
 3. [MEPCO, LLC.]
 4. [Pentair Aurora; Pentair Pump Group]
 5. [Taco Comfort Solutions]
 6. [Thrush Co. Inc.]
 7. <Insert manufacturer's name>
- C. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.
- D. Capacities and Characteristics:
1. Capacity: <Insert gpm (L/s)>.
 2. Total Dynamic Head: <Insert feet (kPa)>.
 3. Inlet and Outlet Size: <Insert NPS (DN)>.
 4. Pump Control: [Pressure switch][Thermostat][Timer].
 5. Pump Speed: <Insert rpm>.
 6. Motor Horsepower: <Insert value>.
 7. Electrical Characteristics:
 - a. Volts: [120][240]<Insert number> V.
 - b. Phases: [Single][Three] phase.
 - c. Hertz: [60]<Insert number> Hz.
 - d. Full-Load Amperes: <Insert number> A.
 - e. Minimum Circuit Ampacity: <Insert number> A.
 - f. Maximum Overcurrent Protection: <Insert number> A.
- E. Pump Construction:
1. Casing:
 - a. Radially split [bronze][brass][or][cast iron] with threaded companion-flange connections for pumps with NPS 2 (DN 50) pipe connections and flanged connections for pumps with NPS 2-1/2 (DN 65) pipe connections.
 - b. Built to permit servicing of pump internals without disturbing the casing or the suction and discharge piping.
 - c. Gauge port tapings at suction and discharge nozzles.
 2. Impeller: [Bronze][or][brass], statically and dynamically balanced, closed, and keyed to shaft.
 3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
 4. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
 5. Seal: Mechanical, with [carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket]<Insert seal type>.

6. Bearings: **[Grease-lubricated][or][permanently lubricated]** ball type.
7. Minimum Working Pressure: **[175 psig (1200 kPa)]<Insert pressure>**.
8. Continuous Operating Temperature: **[225 deg F (107 deg C)]<Insert temperature>**.

- F. Motor: Single speed, with grease-lubricated ball bearings; **[resiliently][or][rigidly]** mounted to pump casing.

2.5 VERTICALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Alyan Pump Company]**
2. **[Armstrong Fluid Technology]**
3. **[Bell & Gossett; a Xylem brand]**
4. **[Flo Fab Inc]**
5. **[GRUNDFOS CBS Inc.]**
6. **[MEPCO, LLC.]**
7. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
8. **[Pentair Aurora; Pentair Pump Group]**
9. **[Taco Comfort Solutions]**
10. **[Thrush Co. Inc.]**
11. **[Weinman Division]**
12. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Alyan Pump Company]**
2. **[Armstrong Fluid Technology]**
3. **[Bell & Gossett; a Xylem brand]**
4. **[Flo Fab Inc]**
5. **[GRUNDFOS CBS Inc.]**
6. **[MEPCO, LLC.]**
7. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
8. **[Pentair Aurora; Pentair Pump Group]**
9. **[Taco Comfort Solutions]**
10. **[Thrush Co. Inc.]**
11. **[Weinman Division]**
12. **<Insert manufacturer's name>**

- C. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted vertical.

- D. Capacities and Characteristics:

1. Capacity: **<Insert gpm (L/s)>**.
2. Total Dynamic Head: **<Insert feet (kPa)>**.
3. Casing Material: **[Bronze][Cast iron]**.
4. Impeller Material: **[ASTM B584, cast bronze][ASTM B584, cast bronze or stainless steel][Stainless steel]**.
5. Minimum Operating Pressure: **175 psig (1200 kPa)**.
6. Maximum Continuous Operating Temperature: **225 deg F (107 deg C)**.

7. Inlet and Outlet Size: <Insert NPS (DN)>.
8. Pump Control: [Pressure switch][Thermostat][Timer].
9. Pump Speed: <Insert rpm>.
10. Motor Horsepower: <Insert value>.
11. Electrical Characteristics:
 - a. Volts: [120][240]<Insert number> V.
 - b. Phases: [Single][Three] phase.
 - c. Hertz: [60]<Insert number> Hz.
 - d. Full-Load Amperes: <Insert number> A.
 - e. Minimum Circuit Ampacity: <Insert number> A.
 - f. Maximum Overcurrent Protection: <Insert number> A.

E. Pump Construction:

1. Casing: Radially split [bronze][cast or ductile iron], with wear rings and threaded companion-flange connections for pumps with NPS 2 (DN 50) pipe connections and flanged connections for pumps with NPS 2-1/2 (DN 65) pipe connections. [Include pump manufacturer's base attachment for mounting pump on concrete base.]
2. Impeller: [Bronze][brass][or][stainless steel], statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: [Steel][or][stainless-steel] shaft, with copper-alloy shaft sleeve.
4. Shaft Coupling: Flexible or rigid type if pump is provided with coupling.
5. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal.
6. Bearings: Oil-lubricated; bronze-journal or ball type.
7. Minimum Working Pressure: [175 psig (1200 kPa)]<Insert pressure>.
8. Continuous Operating Temperature: [225 deg F (107 deg C)]<Insert temperature>.

F. Motor: Single speed, with grease-lubricated ball bearings; rigidly mounted to pump casing.

2.6 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.7 CONTROLS

A. Pressure Switches: Electric, adjustable for control of [water-supply]<Insert application> pump.

1. Type: Water-immersion pressure sensor, for installation in piping.
2. Enclosure: NEMA 250, [Type 4X]<Insert type>.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: [24 V ac][120 V ac]<Insert power>.
6. Settings: Start pump at <Insert pressure> and stop pump at <Insert pressure>.

B. Thermostats: Electric; adjustable for control of [hot-water circulation]<Insert application> pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: [50 to 125 deg F (10 to 52 deg C)][65 to 200 deg F (18 to 93 deg C)][100 to 240 deg F

- (38 to 116 deg C)]<Insert temperature range>.
3. Enclosure: NEMA 250, [Type 4X]<Insert type>.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: [24 V ac][120 V ac]<Insert power>.
7. Settings: Start pump at [105 deg F (41 deg C)][110 deg F (43 deg C)][115 deg F (46 deg C)]<Insert temperature> and stop pump at [120 deg F (49 deg C)][125 deg F (52 deg C)]<Insert temperature>.

C. Timers: Electric, for control of [hot-water circulation]<Insert application> pump.

1. Type: Programmable, [seven-day]<Insert time> clock with manual override on-off switch.
2. Enclosure: NEMA 250, [Type 1]<Insert type>, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: [24 V ac][120 V ac]<Insert power>.
6. Programmable Sequence of Operation: [Up to two on-off cycles each day for seven days]<Insert operational sequence>.

D. Time-Delay Relays: Electric, for control of hot-water circulation pump between water heater and connected hot-water storage tank.

1. Type: Adjustable time-delay relay.
2. Range: Up to five minutes.
3. Setting: Five minutes.
4. Enclosure: NEMA 250, [Type 4X]<Insert type>.
5. Operation of Pump: On or off.
6. Transformer: Provide if required.
7. Power Requirement: [24 V ac][120 V ac]<Insert power>.
8. Programmable Sequence of Operation: Limit pump operation to periods of burner operation, plus maximum five minutes after the burner stops.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for domestic-water-piping system to verify actual locations of piping connections before pump installation.

3.2 INSTALLATION OF PUMPS

- A. Comply with HI 1.4.
- B. Mount pumps in orientation complying with manufacturer's written instructions.
- C. Pump Mounting:
 1. Install vertically mounted, in-line, close-coupled centrifugal pumps with cast-iron base mounted on concrete base using vibration isolation type and deflection as specified in [Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."][Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."] Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch (450-mm)** centers around the full perimeter of concrete base.
 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.
1. Comply with requirements for vibration isolation devices specified in [Section 220548 "**Vibration and Seismic Controls for Plumbing Piping and Equipment.**"] [Section 220548.13 "**Vibration Controls for Plumbing Piping and Equipment.**"] Fabricate brackets or supports as required.
 2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- E. Install pressure switches in water-supply piping.
- F. Install thermostats in hot-water return piping.
- G. Install timers **[on wall in engineer's office]** <Insert location>.
- H. Install time-delay relays in piping between water heaters and hot-water storage tanks.

3.3 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.
- C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
 - a. Horizontally mounted, in-line, separately coupled centrifugal pumps.
 - b. Horizontally mounted, in-line, close-coupled centrifugal pumps.
 - c. Vertically mounted, in-line, close-coupled centrifugal pumps.
 - d. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties." Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
1. Install pressure gauge[**and snubber**] at suction of each pump and pressure gauge[**and snubber**] at discharge of each pump. Install at integral pressure-gauge tappings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 220500 "Common Work Results for Plumbing."

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring between temperature controllers and devices.
- C. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

3.5 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].
- D. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.7 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Set **[pressure switches,][thermostats,][timers,][and][time-delay relays]** for automatic starting and stopping operation of pumps.
 - 5. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.

- b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
- c. Verify that pump is rotating in the correct direction.
- 6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
- 7. Start motor.
- 8. Open discharge valve slowly.
- 9. Adjust temperature settings on thermostats.
- 10. Adjust timer settings.

3.8 ADJUSTING

- A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.
- C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 22 11 23 23

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Task	Specification	Specification Description
22 11 23 23	22 11 00 00	Gray-Water Piping
22 11 23 23	23 21 23 00	Hydronic Pumps



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SECTION 22 12 19 00 - FACILITY GROUND-MOUNTED, POTABLE-WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Potable-water tank, ground mounted - welded steel, reservoir type.
2. Potable-water tank, ground mounted - welded steel, standpipe type.
3. Potable-water tank, ground mounted - bolted steel, reservoir type.
4. Potable-water tank, ground mounted - bolted steel, standpipe type.
5. Potable-water tank, ground mounted - concrete, wire- or strand-wound.
6. Paint materials.
7. Shop painting.
8. Ground-mounted, potable-water storage tank appurtenances.

B. Related Requirements:

1. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components.
2. Section 221216 "Facility Elevated, Potable-Water Storage Tanks" for multiple-column, elevated water-storage tanks and for single-pedestal, elevated water-storage tanks.

1.2 DEFINITIONS

- A. Bottom Capacity Level (BCL): Water level above which the specified capacity is provided. In a ground-supported tank (reservoir or standpipe), the BCL is the water level in the tank shell when the tank is emptied through the specified discharge fittings, unless otherwise specified.
- B. Capacity: Net volume, in **gallons (liters)**, that may be removed from a tank filled to TCL and emptied to BCL.
- C. CR: Chlorosulfonated polyethylene synthetic rubber.
- D. Minimum Capacity within Operating Range: Capacity when water level is at BCL.
- E. NR: Natural rubber.
- F. Range of Head: Vertical distance between TCL and BCL.
- G. Reservoir: Flat-bottomed, cylindrical, steel ground-mounted water-storage tank with shell height equal to or less than its diameter.
- H. SDWA: Safe Drinking Water Act.
- I. Standpipe: Flat-bottomed, cylindrical, ground-mounted water-storage tank with shell height greater than its diameter.
- J. Top Capacity Level (TCL): Water level defined by the lip of the overflow elevation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details for each facility ground-mounted, potable-water storage tank, including the following:
 - 1. Tank, roof, and shell openings.
 - 2. Safety railings and ladders.
 - 3. Plans, elevations, sections, and attachment details.
 - 4. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 5. Diagram power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Seismic Qualification Certificates: For facility ground-mounted, potable-water storage tanks and components, from manufacturer.
 - 1. Basis for Certification: Include calculation upon which withstand certification is based.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.
- D. Bacteriological test results.
- E. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:
 - 1. Obstruction lighting.
 - 2. Lightning protection.
 - 3. Cathodic protection.
 - 4. Tank heaters.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employ a qualified structural engineer to prepare calculations, Shop Drawings, and other structural data for fabrication and erection of ground-mounted, potable-water storage tanks.
 - 1. Engineering Responsibility: Preparation of data for ground-mounted, potable-water tanks, accessories, specified appurtenances, and concrete supports and foundations, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in

assemblies similar to those indicated for this Project.

- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- C. Pipe Welding: Qualify procedures and personnel in accordance with ASME Boiler and Pressure Vessel Code: Section IX, "Welding, Brazing, and Fusing Qualifications."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Ground-mounted, potable-water tank, including structural reinforcement and foundation, is to withstand the effects of dead and live gravity loads and winds of **[100 mph (161 km/h)]<Insert value>**.
- B. Seismic Performance: Ground-mounted, potable-water storage tank, including structural reinforcement and foundation, is to withstand the effects of earthquake motions. See Section 018123 "Facility Seismic and Wind Criteria" for seismic criteria.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
 - 2. Component Importance Factor: **[1.5][1.0]**.
 - 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.
- C. Thermal Movements: Ground-mounted, potable-water tank, including structural reinforcement and foundation, is to allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>**.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Tanks for Potable-Water Storage and Fire-Suppression Water Supply: Comply with NFPA 22, "Water Tanks for Private Fire Protection,"
- F. Comply with NSF 61 and NSF 372.
- G. Comply with 29 CFR 1910.

2.2 POTABLE-WATER TANKS, GROUND MOUNTED

- A. Potable-Water Tank, Ground Mounted - Welded Steel, Reservoir Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Tank and Construction Co]**
 - b. **[Brown Tank, LLC]**
 - c. **[Caldwell Tanks, Inc.]**
 - d. **[Fisher Tank Company]**
 - e. **[Maguire Iron, Inc.]**
 - f. **[Pittsburg Tank & Tower Co., Inc.]**
 - g. **[Superior Tank Co., Inc]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Tank and Construction Co]**
 - b. **[Brown Tank, LLC]**
 - c. **[Caldwell Tanks, Inc.]**
 - d. **[Fisher Tank Company]**
 - e. **[Maguire Iron, Inc.]**
 - f. **[Pittsburg Tank & Tower Co., Inc.]**
 - g. **[Superior Tank Co., Inc]**
 - h. **<Insert manufacturer's name>**
3. Description: Manufactured, welded-steel tank with welded-steel plates, bolts, rods, and reinforcing steel.
4. Standard: Designed and fabricated in accordance with **[AWWA D100 and AWWA M42][AWWA D100, AWWA M42, and NFPA 22]<Insert standards>**.
5. Capacity: **[50,000 gal. (189 cu. m)][5,000,000 gal. (18 930 cu. m)]<Insert capacity>**.
6. Minimum Capacity within Operating Range: **<Insert capacity>**.
7. Shell Roof:
 - a. **[Dome][Ellipsoidal]** welded steel and self-supporting.
 - b. Conical with **[knuckle and]** column-rafter support.
8. Reservoir Shell Diameter: **<Insert feet (m)>**.
9. BCL: **<Insert height in feet (m) of level above foundation>**.
10. Pipe Connections: Comply with AWWA D100. Match size of water-distribution pipe.
11. Overflow Piping: ASTM A53/A53M, Grade B, Schedule 40, welded-steel pipe with ASTM A234/A234M, Grade WPB, Schedule 40, carbon-steel butt-weld fittings.
12. Roof Opening Hatch at Ladder: Comply with AWWA D100. Steel, hinged cover, **[24 by 24 inches (600 by 600 mm)]<Insert dimensions>** minimum or as required by OSHA, with **[4-inch (100-mm)]<Insert dimension>** curb and **[2-inch (50-mm)]<Insert dimension>** downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.
13. Roof Center Opening: Comply with AWWA D100. Steel, removable, **[20-inch- (500-mm-)]<Insert dimension>** minimum-diameter cover with **[4-inch- (100-mm-)]<Insert dimension>** minimum-height neck and minimum **[2-inch (50-mm)]<Insert dimension>** downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.
14. Shell Sidewall Manholes: Comply with AWWA D100. Provide two steel manholes. One circular, **30 inches (750 mm)** minimum in diameter. The second, **[circular, 24 inches (600 mm) in diameter][circular, 36 inches (900 mm) in diameter][elliptical, 18-by-22-inch- (450-by-560-mm-) minimum size]<Insert shape and dimensions>**.

15. Painter's Accessories: Include **[lugs][couplings][rail]** inside and outside tank for painting.
16. Tank Vent: Steel pipe with stainless steel screen, constructed to prevent entrance of rain, **[insects,]** birds, and animals. **[Include pressure-vacuum screened vent or separate pressure-vacuum relief mechanism to maintain clear screen.]**
17. Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."

B. Potable-Water Tank, Ground Mounted - Welded Steel, Standpipe Type:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Advance Tank and Construction Co]**
 - b. **[Brown Tank, LLC]**
 - c. **[Caldwell Tanks, Inc.]**
 - d. **[Fisher Tank Company]**
 - e. **[Maguire Iron, Inc.]**
 - f. **[Pittsburg Tank & Tower Co., Inc.]**
 - g. **[Superior Tank Co., Inc]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Tank and Construction Co]**
 - b. **[Brown Tank, LLC]**
 - c. **[Caldwell Tanks, Inc.]**
 - d. **[Fisher Tank Company]**
 - e. **[Maguire Iron, Inc.]**
 - f. **[Pittsburg Tank & Tower Co., Inc.]**
 - g. **[Superior Tank Co., Inc]**
 - h. **<Insert manufacturer's name>**
3. Description: Manufactured, welded-steel tank with welded-steel plates, bolts, rods, and reinforcing steel.
4. Standard: Designed and fabricated in accordance with **[AWWA D100 and AWWA M42][AWWA D100, AWWA M42, and NFPA 22]<Insert standards>**.
5. Capacity: **[50,000 gal. (189 cu. m)][5,000,000 gal. (18 930 cu. m)]<Insert capacity>**.
6. Minimum Capacity within Operating Range: **<Insert capacity>**.
7. Shell Roof:
 - a. **[Dome][Ellipsoidal]** welded steel and self-supporting.
 - b. Conical with **[knuckle and]** column-rafter support.
8. Standpipe Shell Height: **<Insert height in feet (m)>** from top of foundation to overflow level.
9. Standpipe Range of Head: **<Insert height in feet (m)>** from BCL to overflow level.
10. BCL: **<Insert height in feet (m) of level above foundation>**.
11. Pipe Connections: Comply with AWWA D100. Match size of water-distribution pipe.
12. Overflow Piping: ASTM A53/A53M, Grade B, Schedule 40, welded-steel pipe with ASTM A234/A234M, Grade WPB, Schedule 40, carbon-steel butt-weld fittings.
13. Roof Opening Hatch at Ladder: Comply with AWWA D100. Steel, hinged cover, **[24 by 24 inches (600 by 600 mm)]<Insert dimensions>** minimum or as required by OSHA, with **[4-inch (100-mm)]<Insert dimension>** curb and **[2-inch (50-mm)]<Insert dimension>** downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.

14. Roof Center Opening: Comply with AWWA D100. Steel, removable, [20-inch- (500-mm-)]<Insert dimension> minimum-diameter cover with [4-inch- (100-mm-)]<Insert dimension> minimum-height neck and minimum [2-inch (50-mm)]<Insert dimension> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.
15. Shell Sidewall Manholes: Comply with AWWA D100. Provide two steel manholes. One circular, 30 inches (750 mm) minimum in diameter. The second, [circular, 24 inches (600 mm) in diameter][circular, 36 inches (900 mm) in diameter][elliptical, 18-by-22-inch- (450-by-560-mm-) minimum size]<Insert shape and dimensions>.
16. Painter's Accessories: Include [lugs][couplings][rail] inside and outside tank for painting.
17. Tank Vent: Steel pipe with stainless steel screen, constructed to prevent entrance of rain,[insects,] birds, and animals.[Include pressure-vacuum screened vent or separate pressure-vacuum relief mechanism to maintain clear screen.]
18. Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."

C. Potable-Water Tank, Ground Mounted - Bolted Steel, Reservoir Type:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Tank Company, Inc.]
 - b. [CST Industries]
 - c. [Pittsburg Tank & Tower Co., Inc.]
 - d. [Superior Tank Co., Inc]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [American Tank Company, Inc.]
 - b. [CST Industries]
 - c. [Pittsburg Tank & Tower Co., Inc.]
 - d. [Superior Tank Co., Inc]
 - e. <Insert manufacturer's name>
3. Description: Manufactured tank with bolted-steel plates, bolts, rods, and reinforcing steel.
4. Standard: Designed and fabricated in accordance with [AWWA D103 and AWWA M42][AWWA D103, AWWA M42, and NFPA 22]<Insert standards>.
5. Capacity: [4000 gal. (15 cu. m)][160,000 gal. (605 cu. m)]<Insert capacity>.
6. Minimum Capacity within Operating Range: <Insert capacity>.
7. Shell Roof: Comply with AWWA D103.
8. Reservoir Shell Diameter: <Insert feet (m)>.
9. BCL: <Insert height in feet (m) of level above foundation>.
10. Pipe Connection: Comply with AWWA D103. Match size of water-distribution pipe.
11. Overflow Piping: ASTM A53/A53M, Grade B, Schedule 40, welded-steel pipe with ASTM A234/A234M, Grade W.B., Schedule 40, carbon-steel butt-weld fittings.
12. Roof Opening Hatch above TCL: Comply with AWWA D103. Steel, hinged cover, [24 by 15 inches (600 by 600 mm)]<Insert dimensions> minimum or as required by OSHA, with 4-inch (100-mm) curb and 2-inch (50-mm) downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.
13. Roof Center Opening: Comply with AWWA D103. steel, removable, [20-inch- (500-mm-)]<Insert dimension> minimum-diameter cover with 4-inch- (100-mm-) minimum-height neck and minimum [2-inch (50-mm)]<Insert dimension> downward overlap with hasp and lock. Construct

- opening with capability of supporting ventilation fan.
 14. Shell Sidewall Manholes: Comply with AWWA D103. Provide two steel manholes, **[circular, minimum 24 inches (600 mm) in diameter][square, minimum 24 by 24 inches (610 by 610 mm) in diameter][elliptical, minimum 18 by 22 inches (450 by 560 mm)][flush rectangular, minimum length 24 inches (610 mm) in shortest direction and maximum length 48 inches (1220 mm) in the longest direction]<Insert shape and dimensions>**.
 15. Painter's Accessories: Include **[lugs][couplings][rail]** inside and outside tank for painting.
 16. Painting, Factory Applied, Internal: **[Epoxy powder coating, NSF and FDA compliant]<Insert coating type>**.
 17. Painting, Factory Applied, External: **[Polyester powder coating]<Insert coating type>**.
 18. Tank Vent: Steel pipe with stainless steel screen, constructed to prevent entrance of rain, **[insects,] birds, and animals.[Include pressure-vacuum screened vent or separate pressure-vacuum relief mechanism to maintain clear screen.]**
 19. Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
- D. Potable-Water Tank, Ground Mounted - Bolted Steel, Standpipe Type:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[American Tank Company, Inc.]**
 - b. **[CSI Industries Inc.]**
 - c. **[Pittsburg Tank & Tower Co., Inc.]**
 - d. **[Superior Tank Co., Inc]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[American Tank Company, Inc.]**
 - b. **[CSI Industries Inc.]**
 - c. **[Pittsburg Tank & Tower Co., Inc.]**
 - d. **[Superior Tank Co., Inc]**
 - e. **<Insert manufacturer's name>**
 3. Description: Manufactured tank with bolted-steel plates, bolts, rods, and reinforcing steel.
 4. Standard: Designed and fabricated in accordance with **[AWWA D103 and AWWA M42][AWWA D103, AWWA M42, and NFPA 22]<Insert standards>**.
 5. Capacity: **[4000 gal. (15 cu. m)][160,000 gal. (605 cu. m)]<Insert capacity>**.
 6. Minimum Capacity within Operating Range: **<Insert capacity>**.
 7. Shell Roof: Comply with AWWA D103.
 8. Standpipe Shell Height: **<Insert height in feet (m)>** from top of foundation to overflow level.
 9. Standpipe Range of Head: **<Insert height in feet (m)>** from BCL to overflow level.
 10. BCL: **<Insert height in feet (m) of level above foundation>**.
 11. Pipe Connection: Comply with AWWA D103. Match size of water-distribution pipe.
 12. Overflow Piping: ASTM A53/A53M, Grade B, Schedule 40, welded-steel pipe with ASTM A234/A234M, Grade W.B., Schedule 40, carbon-steel butt-weld fittings.
 13. Roof Opening Hatch above TCL: Comply with AWWA D103. Steel, hinged cover, **[24 by 15 inches (600 by 600 mm)]<Insert dimensions>** minimum or as required by OSHA, with **4-inch (100-mm) curb and 2-inch (50-mm) downward overlap** with hasp and lock, located over interior ladder and adjacent to exterior ladder.
 14. Roof Center Opening: Comply with AWWA D103. steel, removable, **[20-inch- (500-mm-)]<Insert dimension>** minimum-diameter cover with **4-inch- (100-mm-)** minimum-height neck and

minimum **[2-inch (50-mm)]<Insert dimension>** downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

15. Shell Sidewall Manholes: Comply with AWWA D103. Provide two steel manholes, **[circular, minimum 24 inches (600 mm) in diameter][square, minimum 24 by 24 inches (610 by 610 mm) in diameter][elliptical, minimum 18 by 22 inches (450 by 560 mm)][flush rectangular, minimum length 24 inches (610 mm) in shortest direction and maximum length 48 inches (1220 mm) in the longest direction]<Insert shape and dimensions>**.
16. Painter's Accessories: Include **[lugs][couplings][rail]** inside and outside tank for painting.
17. Painting, Factory Applied, Internal: **[Epoxy powder coating, NSF and FDA compliant]<Insert coating type>**.
18. Painting, Factory Applied, External: **[Polyester powder coating]<Insert coating type>**.
19. Tank Vent: Steel pipe with stainless steel screen, constructed to prevent entrance of rain, **[insects,]** birds, and animals. **[Include pressure-vacuum screened vent or separate pressure-vacuum relief mechanism to maintain clear screen.]**
20. Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."

E. Potable-Water Tank, Ground Mounted - Concrete, Wire- or Strand-Wound:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Crom Corporation (The)]**
 - b. **[DN Tanks]**
 - c. **[Preload Inc.]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crom Corporation (The)]**
 - b. **[DN Tanks]**
 - c. **[Preload Inc.]**
 - d. **<Insert manufacturer's name>**
3. Description: Wire- and strand-wound, circular prestressed concrete tank with option of four types of core walls:
 - a. Type I - cast-in-place concrete with vertical prestressed reinforcement
 - b. Type II - shotcrete with steel diaphragm
 - c. Type III - precast concrete with steel diaphragm; Type IV - cast-in-place concrete with steel diaphragm.
4. Standard: Designed and fabricated in accordance with **[AWWA D110][AWWA D110 and NFPA 22]<Insert standards>**.
5. Capacity: **[100,000 gal. (379 cu. m)][40,000,000 gal. (151 400 cu. m)]<Insert capacity>**.
6. Minimum Capacity within Operating Range: **<Insert capacity>**.
7. Tank Height: **<Insert height in feet (m)>** from top of foundation to overflow.
8. Tank Inside Diameter: **<Insert feet (m)>**.
9. Range of Head: **<Insert height in feet (m)>** from BCL to overflow level.
10. BCL: **<Insert height in feet (m) of level above foundation>**.
11. Tank Floor: Reinforced, cast-in-place concrete.
12. Tank Wall, Cast-in-Place Concrete Tank (AWWA D110 Type I): Mix proportions to meet minimum

- 28-day **[4000 psig (28 MPa)]<Insert pressure>** compressive strength
13. Tank Wall, Shotcrete with Steel Diaphragm Tank (AWWA D110 Type II): Mix proportions to meet minimum 28-day **[4500 psig (31 MPa)]<Insert pressure>** compressive strength. Include steel diaphragm.
14. Tank Wall, Precast Concrete with Steel Diaphragm Tank (AWWA D110 Type III): Comply with AWWA D110. **[4000 psig (28 MPa)]<Insert pressure>** compressive strength. Include steel diaphragm.
15. Tank Wall, Cast-in-Place Concrete with Steel Diaphragm Tank (AWWA D110 Type IV): Comply with AWWA D110. Mix proportions to meet minimum 28-day **[4000 psig (28 MPa)]<Insert pressure>** compressive strength. Include steel diaphragm.
16. Internal Baffling: **[Polypropylene curtain(s) supported by glass-fiber angles][Steel-reinforced concrete block masonry wall(s)][Cast-in-place concrete or shotcrete wall(s)][Precast concrete wall(s)]**.
17. Baffles: Configured to comply with SDWA-mandated disinfectant contact times.
18. Domed Tank Roof: Reinforced, **[cast-in-place][precast][shotcrete]** concrete.
19. Flat Tank Roof: Reinforced, **[cast-in-place][precast]** concrete complying with applicable requirements of ACI 350, with special attention to crack control.
20. Reinforcing Steel: ASTM A767/A767M, **Grade 60 (Grade 240)**, zinc-coated billet steel bars.
21. Waterstops: Comply with AWWA D110.
22. Bearing Pads:
 - a. Material: **[Comply with AWWA D110][NR][ASTM D2240, CR, with durometer hardness of 40 to 50]**.
 - b. Minimum Thickness: **[1/2 inch (13 mm)]<Insert dimension>** under walls and **[1/2 inch (13 mm)]<Insert dimension>** under roof.
 - c. Minimum Width: **[3 inches (75 mm)]<Insert dimension>** under walls and **[2 inches (50 mm)]<Insert dimension>** under roof.
23. Bolts, Nuts, Washers, and Expansion Sleeve Inserts: Stainless steel.
24. Construction and Maintenance Hatch: **[Aluminum][Galvanized-steel]** frame and cover at least **3/16 inch (5 mm)** thick, **48-by-48-inch- (1200-by-1200-mm-)** minimum-size, hinged cover with a **4-inch (100-mm)** neck and **2-inch (50-mm)** downward overlap and having a hasp and lock.**[Locate top of hatch above grade.]**
25. Personnel Hatch: **[Aluminum][Galvanized-steel]** frame and cover at least **3/16 inch (5 mm)** thick, **30-inch- (760-mm-)** minimum, square hinged cover with a **4-inch (100-mm)** neck and **2-inch (50-mm)** downward overlap and having a hasp and lock. Construct opening with capability of supporting ventilation fan.**[Locate top of hatch above grade.]**
26. Tank Vents: **[Fiberglass][Galvanized-steel]** pipe with **[aluminum][stainless steel]** screen, constructed to prevent entrance of rain,**[insects,]** birds, and animals.**[Include pressure-vacuum screened vent or separate pressure-vacuum relief mechanism to maintain clear screen.]**
27. Tank Interior Surface Sealer: Cementitious coating modified with acrylic or styrene-acrylic based polymer.

2.3 PAINT MATERIALS

- A. Paint: Comply with AWWA D102.
- B. Primer: Tank fabricator's **[epoxy-polyamide]<Insert paint>** paint.
- C. Tank Shell Interior Finish Paint: Tank fabricator's **[epoxy-polyamide paint]<Insert paint>** complying with NSF 61 and NSF 372, and compatible with prime coat.
- D. Tank Shell Exterior Intermediate Paint: Tank fabricator's **[epoxy-polyamide]<Insert paint>** paint compatible with prime and finish paint. Intermediate coat is to have a slight color contrast with finish

coat.

- E. Tank Shell Exterior Finish Paint: Tank fabricator's [urethane]<Insert paint> paint.
 - 1. Color: [As selected by Owner from tank manufacturer's paint chart]<Insert color>.

2.4 SHOP PAINTING

- A. Factory coating in accordance with AWWA D103.
- B. Tank Shell Interior Finish Coat: Comply with NSF 61 and NSF 372.
- C. Tank Shell Exterior Finish Coat: Factory coating in accordance with AWWA D103.

2.5 GROUND-MOUNTED, POTABLE-WATER STORAGE TANK APPURTENANCES

- A. Water-Level Controls: Automatic controls for maintaining water level in tank, with valves, piping, and audible and visual alarms to indicate the following:
 - 1. High- and low-water levels.
 - 2. Tank overflowing or tank not filling.
 - 3. <Insert required alarms>.
- B. Obstruction Lighting: Comply with requirements of authorities having jurisdiction.
- C. Lightning Protection: Comply with requirements in Section 264113 "Lightning Protection for Structures."
- D. Cathodic Protection: Comply with requirements in Section 134713 "Cathodic Protection" and with AWWA D104.
- E. Tank Heaters: Comply with NFPA 22 and with capacity to maintain **42 deg F (6 deg C)** water temperature inside surface water-storage tank.
- F. Spiral Staircase:
 - 1. Material: [Galvanized steel]<Insert material>.
 - 2. Size: Custom sized to tank.
 - 3. Accessories: Including step off platform.
 - 4. Safety Devices: As required by 29 CFR 1910 (OSHA) safety and health regulations.
 - 5. Standards: Comply with [AWWA D100][AWWA D103][AWWA D110].
- G. Exterior Ladder: Straight, vertical ladder rungs.
 - 1. Material: [Powder-coated or galvanized][Stainless] steel.
 - 2. Size: Custom sized to tank.
 - 3. Accessories: Including step off platform.
 - 4. Safety Devices: As required by 29 CFR 1910 (OSHA) safety and health regulations.
 - 5. Standards: Comply with [AWWA D100][AWWA D103][AWWA D110].
- H. Interior Ladder: Straight, vertical ladder rungs.
 - 1. Material: [Powder-coated or galvanized][Stainless] steel.

2. Size: Custom sized to tank.
3. Accessories: Including step off platform.
4. Safety Devices: As required by 29 CFR 1910 (OSHA) safety and health regulations.
5. Standards: Comply with [AWWA D100][AWWA D103][AWWA D110].

I. <Insert accessories>.

PART 3 - EXECUTION

3.1 INSTALLATION OF POTABLE-WATER TANKS, GROUND MOUNTED

A. Welded-Steel Tanks:

1. Erect tank shell, accessories, and appurtenances in accordance with AWWA D100 and AWWA M42.
2. Fabricate steel plate sections in the shop. Erect tank shell by welding plate sections in the field.

B. Bolted-Steel Tanks:

1. Erect tank shell, accessories, and appurtenances in accordance with AWWA D103 and AWWA M42.
2. Fabricate tank sections and drill or punch bolt holes in the shop. Install bolts during field erection of tank.

C. Set top of reinforced-concrete foundation at least **6 inches (150 mm)** above finish grade.

D. Install roof hatch near exterior[**and interior**] ladder(s).

E. Install roof center opening near center of roof.

F. Install tank vent at center of roof.

G. Install two manholes in tank wall near grade.

H. Tank Wall: Construct tank wall and install accessories and appurtenances in accordance with AWWA D110.

I. Floor: Reinforced, cast-in-place concrete. Slope floor 1.0 to 1.5 percent from highest point to water outlet pipe. Pour monolithically without cold joints and provide mechanical float finish.

J. Dome Roof: Install reinforced, cast-in-place concrete with circumferential prestressing.[**Place 6-inch (150-mm) waterstop between roof and wall.**]

1. Install curb on roof perimeter with no fewer than 6 downspouts spaced [**60 degrees**]<Insert **number**> and no more than [**50 ft. (15 m)**]<Insert **dimension**> apart.

K. Flat Slab Roof: Install reinforced, cast-in-place concrete with drop panels and support having reinforced, cast-in-place concrete columns. Place solid neoprene bearing pads[**and 6-inch (150-mm) waterstop**] between roof and wall. If voids are present between wall and roof after use of solid bearing pads, fill voids with closed-cell CR pads and soft mastic.

1. Install curb on roof perimeter with no fewer than 6 downspouts spaced [**60 degrees**]<Insert **number**> and no more than [**50 ft. (15 m)**]<Insert **dimension**> apart.

- L. Install construction and maintenance hatch near [wall][ladder].
- M. Install ventilators at highest point of roof.[**Install additional units where indicated.**]

3.2 PIPING CONNECTIONS

- A. Connect tanks to water-distribution piping.
- B. Connect drains to storm-drainage piping.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate is to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate is to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least **1/2 inch (13 mm)** high.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.5 SURFACE PREPARATION OF STEEL TANKS

- A. Surface preparation is specified in [**Section 099113 "Exterior Painting."**][**Section 099600 "High-Performance Coatings."**]
- B. Field Cleaning: After erecting tank shell, remove burrs, dirt, and construction debris and repair damaged finishes. Remove weld splatter, sharp edges on weld seams, and scabs and slivers by grinding. Remove weld flux, slag, fins, and laminations.
- C. Field Surface Preparation: After field cleaning, prepare steel surfaces where shop prime coat has been damaged, in accordance with the Specifications listed above for shop cleaning, and remove dust or residue from cleaned surfaces.
- D. If surface develops rust before prime coat is applied, repeat field surface preparation.

3.6 FIELD PAINTING

- A. Surface preparation is specified in [Section 099113 "Exterior Painting."][Section 099600 "High-Performance Coatings."]
- B. Apply paint in accordance with AWWA D102.
- C. Prime-Coat Touchup: Apply primer to cleaned areas and where shop finish has been damaged during shipping, handling, and erection. Apply prime coat to a dry film thickness of **3.0 to 5.0 mils (0.08 to 0.13 mm)** for tank interior and to a dry film thickness of **2.0 to 3.0 mils (0.05 to 0.08 mm)** for exterior tank and support surfaces.
- D. Tank Shell Interior Finish Coats: Apply two coats of interior finish paint above bottom ring to a dry film thickness of **4.0 to 5.0 mils (0.1 to 0.13 mm)**. Apply interior finish paint to surfaces below bottom ring to a dry film thickness of **8.0 to 10.0 mils (0.2 to 0.25 mm)**.
- E. Tank Shell and Steel Support Exterior Coats: Apply intermediate paint to a dry film thickness of **2.0 to 3.0 mils (0.05 to 0.08 mm)**. Apply finish paint to a dry film thickness of **2.0 to 3.0 mils (0.05 to 0.08 mm)**.
- F. Concrete tanks do not require painting.
- G. Paint concrete, surface water-storage tanks in accordance with [Section 099113 "Exterior Painting."][Section 099600 "High-Performance Coatings."]
- H. Tank Exterior Lettering and Logo: Apply [**one coat**][**two coats**] of urethane paint to a dry film thickness of **2.0 to 3.0 mils (0.05 to 0.08 mm)**[**for each application**].
- I. Overflow Pipe: Paint pipe exterior that is outside tank and structure as indicated for tank exterior.
- J. Exterior Ladders: Paint as indicated for tank shell exterior.
- K. Do not paint if ambient temperature is less than **50 deg F (10 deg C)** or is expected to drop below **40 deg F (5 deg C)** in the next 18 hours. Do not paint if temperature of steel surface is higher than **125 deg F (52 deg C)**. Do not apply paint if surfaces are wet or damp, if precipitation is expected, or if relative humidity will exceed 85 percent. Do not spray paint when wind velocity exceeds **15 mph (24 km/h)**. Maintain at least a 24-hour waiting period between coats. Provide adequate ventilation in tank during painting to maintain clear atmosphere and provide explosion-proof flood lighting and spot lighting.
- L. Complete daily painting to allow time for paint to dry before condensation is expected.

3.7 INSTALLATION OF SURFACE WATER-STORAGE TANK APPURTENANCES

- A. Install and adjust water-level control valves, piping, and alarms.
- B. Install obstruction lighting in accordance with authorities having jurisdiction.
- C. Install lightning protection in accordance with Section 264113 "Lightning Protection for Structures."
- D. Install cathodic protection in accordance with Section 134713 "Cathodic Protection" and AWWA D104.
- E. Install tank heaters in accordance with NFPA 22.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections **[with the assistance of a factory-authorized service representative]**:
 - 1. Tank Weld Test: Use radiographic method in accordance with AWWA D100. Repair failures and retest.
 - 2. Leak Test for Welded Reservoirs or Standpipes: Comply with AWWA D100 **[and NFPA 22]**. Fill tanks with potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.
 - a. Water will be furnished by Owner.
 - 3. Leak Test for Bolted Reservoirs or Standpipes: Comply with AWWA D103 **[and NFPA 22]**. Fill tanks with potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.
 - a. Water will be furnished by Owner.
 - 4. Leak Test for Concrete Tanks: Comply with **[AWWA D110][and NFPA 22]**. Fill tanks with potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.
 - a. Water will be furnished by Owner.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Unit will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean interior and exterior of ground-mounted, potable-water storage tanks.
- B. Disinfect surface water-storage tanks in accordance with **[AWWA C652][requirements of authorities having jurisdiction]**.

3.10 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain the following:
 - 1. Obstruction lighting.
 - 2. Water-level controls.
 - 3. Tank heaters.



END OF SECTION 22 12 19 00



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Task	Specification	Specification Description
22 12 19 00	23 13 23 00	Facility Aboveground Fuel-Oil Storage Tanks



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SECTION 22 12 23 00 - FACILITY INDOOR POTABLE-WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel, pressure, potable-water storage tanks.
2. Steel, nonpressure, potable-water storage tanks.
3. Steel, floating-wafer, potable-water storage tanks.
4. Steel, precharged, potable-water storage tanks.
5. Insulated, steel, potable-water storage tanks.
6. Plastic, pressure, potable-water storage tanks.
7. Plastic, nonpressure, potable-water storage tanks.

1.2 DEFINITIONS

- A. HDPE: High-density polyethylene plastic.
- B. LDPE: Low-density polyethylene plastic.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Steel water tanks to withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

1.4 ACTION SUBMITTALS

A. Product Data:

1. Steel, pressure, potable-water storage tanks.
2. Steel, nonpressure, potable-water storage tanks.
3. Steel, floating-wafer, potable-water storage tanks.
4. Steel, precharged, potable-water storage tanks.
5. Insulated, steel, potable-water storage tanks.
6. Plastic, pressure, potable-water storage tanks.
7. Plastic, nonpressure, potable-water storage tanks.

B. Product Data Submittals: For each product indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water storage tanks.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For steel water storage tanks, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of potable-water storage tank, from manufacturer.
- C. Source quality-control reports.
- D. Purging and disinfecting reports.

1.6 QUALITY ASSURANCE

- A. ASME Compliance for Steel Tanks: Fabricate and label steel, ASME-code, potable-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- B. ASME Compliance for FRP Tanks: Fabricate and label FRP, ASME-code, potable-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section X, "Fiber-Reinforced Plastic Pressure Vessels."
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water storage tanks and components. Include appropriate NSF marking.
- D. Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for potable-water storage tanks. Include appropriate NSF marking.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 STEEL, PRESSURE, POTABLE-WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[A. O. Smith Corporation]**
 - 2. **[Adamson Global Technology]**
 - 3. **[Aldrich Company, Inc. (The)]**
 - 4. **[Bradford White Corporation]**
 - 5. **[Cemline Corporation]**

6. [Flo Fab Inc]
7. [GSW Water Heating]
8. [HESCO Bastion Ltd.]
9. [Lochinvar, LLC]
10. [Niles Steel Tank: a subsidiary of Bradford White Corporation]
11. [Precision Boilers]
12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A. O. Smith Corporation]
2. [Adamson Global Technology]
3. [Aldrich Company, Inc. (The)]
4. [Bradford White Corporation]
5. [Cemline Corporation]
6. [Flo Fab Inc]
7. [GSW Water Heating]
8. [HESCO Bastion Ltd.]
9. [Lochinvar, LLC]
10. [Niles Steel Tank: a subsidiary of Bradford White Corporation]
11. [Precision Boilers]
12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

- C. Description: Steel, [**horizontal**][**vertical**], pressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: [**ASME code, steel**][**Steel**], constructed with nontoxic welded joints, for [**125-psig (860-kPa)**][**150-psig (1035-kPa)**]<Insert value> working pressure.
- F. Manhole: Watertight, for tank more than [**36 inches (915 mm)**]<Insert dimension> in diameter; same pressure rating as tank.
- G. Tappings: Factory-fabricated[**stainless**] steel, welded to tank[**before testing and labeling**].
1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.



- H. Specialties and Accessories: Include tappings in tank and the following:
 - 1. Pressure relief valve.
 - 2. Pressure gage.
 - 3. Thermometer.
 - 4. Air-charging connection.
 - 5. Gage glass, brass fittings, compression stops, and gage-glass guard.
- I. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank[**before testing and labeling**].
- J. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[**before testing and labeling**].
- K. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
 - 1. Lining Material: [Cement][Copper]<Insert material>.
 - 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- L. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.

2.2 STEEL, NONPRESSURE, POTABLE-WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [Adamson Global Technology]
 - 2. [Highland Tank & Manufacturing Company, Inc.]
 - 3. [Niles Steel Tank: a subsidiary of Bradford White Corporation]
 - 4. [RECO USA]
 - 5. [Steel Tank and Fabricating Corporation (STAFCO)]
 - 6. [Wood, John Co]
 - 7. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [Adamson Global Technology]
 - 2. [Highland Tank & Manufacturing Company, Inc.]
 - 3. [Niles Steel Tank: a subsidiary of Bradford White Corporation]
 - 4. [RECO USA]
 - 5. [Steel Tank and Fabricating Corporation (STAFCO)]
 - 6. [Wood, John Co]
 - 7. <Insert manufacturer's name>
- C. Description: Steel, [horizontal][vertical], nonpressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: Steel, constructed with nontoxic welded joints.

- F. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter.
- G. Cover for Open Tank: **[Plastic][Steel, with lining same as or similar to tank lining and]** with shape that encloses top of tank.
- H. Tappings: Factory-fabricated **[stainless]** steel, welded to tank.
 - 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 - 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- I. Specialties and Accessories: Include tappings in the tank and the following:
 - 1. Vacuum relief valve.
 - 2. Free air vent with insect screen.
 - 3. Thermometer.
 - 4. Gage glass, brass fittings, compression stops, and gage-glass guard.
- J. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank **[before testing and labeling]**.
- K. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank **[before testing and labeling]**.
- L. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
 - 1. Lining Material: **[Cement][Copper]<Insert material>**.
 - 2. Coating: **[Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>**.
- M. Exterior Coating: **[Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>**.

2.3 STEEL, FLOATING-WAFER, POTABLE-WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1. **[Cemline Corporation]**
 - 2. **[State Industries]**
 - 3. **[Wood, John Co]**
 - 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Cemline Corporation]**
 - 2. **[State Industries]**
 - 3. **[Wood, John Co]**
 - 4. **<Insert manufacturer's name>**
- C. Description: Steel, vertical, pressure-rated tank with cylindrical sidewalls and with floating-wafer separator.

- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: **[ASME code, steel][Steel]**, constructed with nontoxic welded joints, for **[125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value>** working pressure.
- F. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter; same pressure rating as tank.
- G. Floating Wafer: Nontoxic plastic, of diameter to match tank.
- H. Tappings: Factory-fabricated **[stainless]** steel, welded to tank **[before testing and labeling]**.
 - 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 - 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- I. Specialties and Accessories: Include tappings in tank and the following:
 - 1. Pressure relief valve.
 - 2. Pressure gage.
 - 3. Thermometer.
 - 4. Air-charging connection.
 - 5. Gage glass, brass fittings, compression stops, and gage-glass guard.
- J. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank **[before testing and labeling]**.
- K. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
 - 1. Lining Material: **[Copper]<Insert material>**.
 - 2. Coating: **[Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>**.
- L. Exterior Coating: **[Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>**.

2.4 STEEL, PRECHARGED, POTABLE-WATER STORAGE TANKS

- A. Steel, Precharged, Diaphragm, Water Storage Tanks:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMTROL, Inc.]**
 - b. **[Armstrong Fluid Technology]**
 - c. **[Flexcon Industries]**
 - d. **[Flo Fab Inc]**
 - e. **[Myers, F.E.; Pentair Ltd]**
 - f. **[State Industries]**
 - g. **[Taco Comfort Solutions]**
 - h. **[Wessels Company]**

- i. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [AMTROL, Inc.]
 - b. [Armstrong Fluid Technology]
 - c. [Flexcon Industries]
 - d. [Flo Fab Inc]
 - e. [Myers, F.E.; Pentair Ltd]
 - f. [State Industries]
 - g. [Taco Comfort Solutions]
 - h. [Wessels Company]
 - i. <Insert manufacturer's name>
 3. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.
 4. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
 5. Operation: Factory-installed, butyl-rubber diaphragm.
- B. Steel, Precharged, Bladder, Water Storage Tanks:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Armstrong Fluid Technology]
 - b. [Flo Fab Inc]
 - c. [Taco Comfort Solutions]
 - d. [Wessels Company]
 - e. [Wood, John Co]
 - f. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Armstrong Fluid Technology]
 - b. [Flo Fab Inc]
 - c. [Taco Comfort Solutions]
 - d. [Wessels Company]
 - e. [Wood, John Co]
 - f. <Insert manufacturer's name>
 3. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.
 4. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
 5. Operation: Factory-installed, butyl-rubber bladder.
- C. Construction: [ASME code, steel][Steel], constructed with nontoxic welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.

- D. Tappings: Factory-fabricated[**stainless**] steel, welded to tank[**before testing and labeling**].
1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- E. Specialties and Accessories: Include tappings in tank and the following:
1. Pressure gage.
 2. **<Insert required specialties>**.
- F. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[**before testing and labeling**].
- G. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
1. Lining Material: [Cement][Copper]<Insert material>.
 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- H. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.

2.5 INSULATED, STEEL, POTABLE-WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [A. O. Smith Corporation]
 2. [Bradford White Corporation]
 3. [GSW Water Heating]
 4. [HESCO Bastion Ltd.]
 5. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
 6. [Lochinvar, LLC]
 7. [Precision Boilers]
 8. [PVI; A WATTS Brand]
 9. [RBI]
 10. [State Industries]
 11. [Vaughn Thermal Corporation]
 12. [Wessels Company]
 13. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. [A. O. Smith Corporation]
 2. [Bradford White Corporation]
 3. [GSW Water Heating]
 4. [HESCO Bastion Ltd.]
 5. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
 6. [Lochinvar, LLC]
 7. [Precision Boilers]
 8. [PVI; A WATTS Brand]
 9. [RBI]

10. [State Industries]
11. [Vaughn Thermal Corporation]
12. [Wessels Company]
13. <Insert manufacturer's name>

- C. Description: Steel, vertical, pressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: [ASME code, steel][Steel], constructed with nontoxic welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.
- F. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter; same pressure rating as tank.
- G. Tappings: Factory-fabricated[stainless] steel, welded to tank[before testing and labeling].
 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- H. Specialties and Accessories: Include tappings in tank and the following:
 1. Pressure relief valve.
 2. Pressure gage.
 3. Thermometer.
 4. Air-charging connection.
 5. Gage glass, brass fittings, compression stops, and gage-glass guard.
- I. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[before testing and labeling].
- J. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
 1. Lining Material: [Cement][Copper]<Insert material>.
 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- K. Insulation: Factory-installed fiberglass or polyurethane foam; surrounding entire tank except connections and other openings; suitable for tank operating temperature; and complying with ASHRAE/IESNA 90.1.
- L. Jacket: Steel, with manufacturer's standard finish unless otherwise indicated.

2.6 PLASTIC, PRESSURE, POTABLE-WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Pentair, Inc.]
 2. [Tankinetics, Inc]
 3. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Pentair, Inc.]**
 - 2. **[Tankinetics, Inc]**
 - 3. **<Insert manufacturer's name>**
- C. Description: FRP, vertical, pressure-rated tank with cylindrical sidewalls.
- D. Construction: **[ASME code, composite FRP][Composite FRP], [contact-molded][or][filament-wound]**, thermosetting-resin tank for **[100-psig (690-kPa)][125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value>** working pressure.
 - 1. Tank Lining Material: Nontoxic **[HDPE][LDPE]<Insert material>** complying with NSF 61 Annex G barrier materials for potable-water tanks.
- E. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter; same pressure rating as tank.
- F. Tappings: Factory-fabricated, FRP flanged-end nozzle.
 - 1. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
 - 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- G. Specialties and Accessories: Include tappings in tank and the following:
 - 1. Pressure relief valve.
 - 2. Pressure gage.
 - 3. Thermometer.
- H. Vertical Tank Supports: Factory-fabricated steel legs or FRP skirt attached by FRP brackets to tank sidewall.
- I. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

2.7 PLASTIC, NONPRESSURE, POTABLE-WATER STORAGE TANKS

- A. FRP Potable-Water Storage Tanks:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AMTROL, Inc.]**
 - b. **[Belding Tank Technologies, Inc]**
 - c. **[L. F. Manufacturing, Inc]**
 - d. **[Palmer Manufacturing and Tank Company]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert**

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[AMTROL, Inc.]**
 - b. **[Belding Tank Technologies, Inc]**
 - c. **[L. F. Manufacturing, Inc]**
 - d. **[Palmer Manufacturing and Tank Company]**
 - e. **<Insert manufacturer's name>**
3. Description: FRP, vertical, nonpressure-rated water tank; complying with NSF 61 Annex G barrier materials for potable-water tanks.
 4. Construction: **[ASTM D3299, filament-wound][or][ASTM D4097, contact-molded]** FRP.
 5. Tappings: Factory-fabricated, FRP flanged-end nozzle.
 - a. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
 - 1) **[Exception: Tappings may be threaded FRP coupling integral with nozzle for connections for plastic piping.]**
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting tank.

B. PE Potable-Water Storage Tanks:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Amprotec, Inc.]**
 - b. **[Assmann Corporation of America]**
 - c. **[Chem-Tainer Industries]**
 - d. **[Poly Processing Company]**
 - e. **[Premier Plastics Inc.]**
 - f. **[Snyder Industries, Inc.]**
 - g. **[Steel Tank and Fabricating Corporation (STAFCO)]**
 - h. **[TolPlast Company, Inc.]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Amprotec, Inc.]**
 - b. **[Assmann Corporation of America]**
 - c. **[Chem-Tainer Industries]**
 - d. **[Poly Processing Company]**
 - e. **[Premier Plastics Inc.]**
 - f. **[Snyder Industries, Inc.]**
 - g. **[Steel Tank and Fabricating Corporation (STAFCO)]**
 - h. **[TolPlast Company, Inc.]**
 - i. **<Insert manufacturer's name>**
3. Description: PE, vertical, flat-bottom, nonpressure-rated water tank; complying with NSF 61

- Annex G barrier materials for potable-water tanks.
4. Construction: ASTM D1998, molded PE.
 5. Tappings: Factory-fabricated bulkhead fittings attached to tank.
 - a. NPS 2 (DN 50) and Smaller: With female thread.
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting entire bottom of tank.

- C. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter.
- D. Cover for Open Tank: Plastic, same as or similar to tank material and with shape that encloses top of tank.
- E. Specialties and Accessories: Include tappings in the tank and the following:
 1. Vacuum relief valve.
 2. Free air vent with insect screen.
 3. Thermometer.
 4. Gage glass, brass fittings, compression stops, and gage-glass guard.

2.8 SOURCE QUALITY CONTROL

- A. Test and inspect potable-water storage tanks according to the following tests and inspections and prepare test reports:
 1. Pressure Testing for ASME-Code, Potable-Water Storage Tanks: Hydrostatically test to ensure structural integrity and freedom from leaks. Fill tanks with water, vent air, pressurize to 1-1/2 times tank pressure rating, disconnect test equipment, hold pressure for 30 minutes with no drop in pressure, and check for leaks.
 2. Pressure Testing for Non-ASME-Code, Pressure, Potable-Water Storage Tanks: Hydrostatically test to ensure structural integrity and freedom from leaks at pressure of **[50 psig (345 kPa)]<Insert value>** above system operating pressure, but not less than **[150 psig (1035 kPa)]<Insert value>**. Fill tanks with water, vent air, pressurize tanks, disconnect test equipment, hold pressure for two hours with no drop in pressure, and check for leaks.
 3. Testing for Nonpressure, Potable-Water Storage Tanks: Fill tanks to water operating level to ensure structural integrity and freedom from leaks. Hold water level for two hours with no drop in water level.
- B. Repair or replace tanks that fail test with new tanks, and repeat until test is satisfactory.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install water storage tanks on concrete bases, level and plumb, firmly anchored. Arrange so devices needing servicing are accessible.
 1. Install horizontal tanks on **[concrete piers and factory-fabricated][fabricated steel supports and]** saddles.

- B. Anchor tank supports and tanks to substrate.
 - 1. Use steel or FRP straps over or around plastic tanks.
- C. Install tank seismic restraints.
- D. Install thermometers and pressure gages on water storage tanks and piping if indicated. Thermometers and pressure gages are specified in Section 220500 "Common Work Results for Plumbing."
- E. Install the following devices on tanks where indicated:
 - 1. Pressure relief valves.
 - 2. Temperature and pressure relief valves.
 - 3. Vacuum relief valves.
 - 4. Tank vents on nonpressure tanks.
 - 5. Connections to accessories.
- F. After installing tanks with factory finish, inspect finishes and repair damages to finishes.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to potable-water storage tanks to allow service and maintenance.
- C. Connect water piping to water storage tanks with unions or flanges and with shutoff valves. Connect tank drains with shutoff valves and discharge over closest floor drains.
 - 1. General-duty valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
 - a. Valves NPS 2 (DN 50) and Smaller: Gate or ball.
 - b. Valves NPS 2-1/2 (DN 65) and Larger: Gate or butterfly.
 - c. Drain Valves: **NPS 3/4 (DN 20)** gate or ball valve. Include outlet with, or nipple in outlet with, ASME B1.20.7, 3/4-11.5NH thread for garden-hose service, threaded cap, and chain.
 - 2. Water Piping Connections: Make connections to dissimilar metals with dielectric fittings. Dielectric fittings are specified in Section 221116 "Domestic Water Piping."
 - 3. Connect air piping to hydropneumatic tanks with unions or flanges and gate or ball valves. Make connections to dissimilar metals with dielectric fittings, which are specified in Section 221513 "General-Service Compressed-Air Piping."

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following final checks before filling:
 - 1. Verify that air precharge in precharged tanks is correct.

2. Test operation of tank accessories and devices.
3. Verify that pressure relief valves have correct setting.
 - a. Manually operate pressure relief valves.
 - b. Adjust pressure settings.
4. Verify that vacuum relief valves are correct size.
 - a. Manually operate vacuum relief valves.
 - b. Adjust vacuum settings.

B. Filling Procedures: Follow manufacturer's written procedures. Fill tanks with water to operating level.

3.5 CLEANING

A. Clean and disinfect potable-water storage tanks.

B. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, use procedure described in AWWA C652 or as described below:

1. Purge water storage tanks with potable water.
2. Disinfect tanks by one of the following methods:
 - a. Fill tanks with water-chlorine solution containing at least **50 ppm (50 mg/L)** of chlorine. Isolate tanks and allow to stand for 24 hours.
 - b. Fill tanks with water-chlorine solution containing at least **200 ppm (200 mg/L)** of chlorine. Isolate tanks and allow to stand for three hours.
3. Flush tanks, after required standing time, with clean, potable water until chlorine is not present in water coming from tank.
4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination made by authorities having jurisdiction shows evidence of contamination.

C. Prepare written reports for purging and disinfecting activities.

END OF SECTION 22 12 23 00



Task	Specification	Specification Description
22 12 23 13	22 12 23 00	Facility Indoor Potable-Water Storage Tanks
22 12 23 13	22 33 00 00	Electric Domestic-Water Heaters
22 12 23 13	22 34 00 00	Fuel-Fired, Domestic-Water Heaters



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SECTION 22 12 23 26 - FACILITY FUEL-OIL PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fuel-oil pipes, tubes, and fittings.
2. Double-containment pipe and fittings.
3. Piping specialties.
4. Joining materials.
5. Specialty valves.
6. Mechanical leak-detection valves.
7. Leak-detection and monitoring system.
8. Labels and identification.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Fuel-oil pipes, tubes, and fittings.
2. Double-containment pipe and fittings.
3. Piping specialties.
4. Joining materials.
5. Specialty valves.
6. Mechanical leak-detection valves.
7. Leak-detection and monitoring system.
8. Labels and identification.

B. Product Data Submittals:

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, pressure ratings, operating characteristics, electrical characteristics, settings, and furnished specialties and accessories.

C. Shop Drawings: For fuel-oil piping.

1. Include plans, elevations sections, hangers, and supports for multiple pipes.
2. Include details of location of anchors, alignment guides, and expansion joints and loops.
3. Scale: **[1/4 inch per foot (1:50)]<Insert scale>**.

D. Delegated Design Submittals: For fuel-oil piping[**and supports**],[, **and seismic restraints**] indicated to comply with performance requirements and design criteria.

1. Include analysis data[**signed and sealed by the qualified professional engineer responsible for their preparation**].
2. Detail fabrication and assembly of anchors and seismic restraints.
3. Design Calculations: Calculate requirements for selecting seismic restraints.
4. Detail fabrication and assembly of pipe anchors, hangers, supports for multiple pipes, and

attachments of the same to building structure.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:
 - 1. Plans and details, or Building Information Model (BIM), drawn to scale, on which fuel-oil piping and tanks are shown and coordinated with other installations, using input from installers of the items involved.
- B. Brazing certificates.
- C. Welding certificates.
- D. Seismic qualification certificate.
- E. Field quality-control reports.
- F. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-oil equipment and accessories.
 - 1. Indicate actual installed items by marking submittals with an arrow or box.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, **from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

- A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in **[state]<Insert jurisdiction>** where Project is located and who is experienced in providing engineering services of the type indicated.
- B. Brazing: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code: Section IX.
- C. Steel Support Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Pipe Welding Qualifications: Qualify procedures and personnel in accordance with ASME Boiler and Pressure Vessel Code.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as indicated on Shop Drawings. Do not move or lift tanks unless empty.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store PE and PE-coated pipes, tubes, and valves in manner to avoid damaging the coating and to protect from direct sunlight.

1.8 FIELD CONDITIONS

- A. Interruption of Existing Fuel-Oil Service: Do not interrupt fuel-oil service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fuel-oil supply in accordance with requirements indicated:
 - 1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[two]<Insert number>** days in advance of proposed interruption of fuel-oil service.
 - 2. Do not proceed with interruption of fuel-oil service without **[Architect's][Construction Manager's][Owner's]** written permission.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include those due to defective materials or workmanship for materials including piping, dispenser sumps, watertight sump entry boots, terminations, and other end fittings.
 - 2. Warranty Period: **[10][30]<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.
- B. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.
- C. Fuel-Oil Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.
- D. Comply with requirements of the EPA and of state and local authorities having jurisdiction.
- E. Maximum Operating-Pressure Ratings: **[3 psig (21 kPa)]<Insert pressure>** fuel-oil supply pressure at oil-fired appliances.
- F. Delegated Design: **[Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to]** design vibration isolation[, supports,][anchors,][and seismic restraints]

and multiple pipe supports and hangers for fuel-oil piping, using performance requirements and design criteria indicated.

- G. Seismic Performance: Fuel-oil piping and associated components to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**. See Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment".
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."
 2. Component Importance Factor: **[1.5][1.0]**.
 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

2.2 FUEL-OIL PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 2. Wrought-Steel Welding Fittings: ASTM A234/A234M, for butt and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic; gaskets compatible with fuel oil.
 - e. Bolts and Nuts: ASME B18.2.1, zinc alloy-plated steel.
 5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Stainless Steel Pipe: Minimum **0.035-inch (0.089-cm) thickness**, ASTM A269/A269M and ASTM A312/A312M, **[Type 304][Type 316]**, grooved ends, seamless.
1. Stainless Steel Grooved Fittings: ASME B16.5, Class 150.
 2. Stainless Steel Press Fittings: ASME B16.5, Class 150.
 3. Include bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Grooved or press to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: **[NBR]<Insert gasket material>** gaskets compatible with fuel oil.
 - e. Bolts and Nuts: ASME B18.2.1, Type 304 stainless steel.
- C. Drawn-Temper Copper Tube: Comply with **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)]**.
1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.

2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
 - a. Gasket Material: Asbestos free, ASME B16.20 metallic or ASME B16.21 nonmetallic; gaskets compatible with fuel oil.
 - b. Bolts and Nuts: ASME B18.2.1, zinc alloy-plated steel.

D. Annealed-Temper Copper Tube: Comply with **[ASTM B88, Type K (ASTM B88M, Type A)][ASTM B88, Type L (ASTM B88M, Type B)]**.

1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.

2.3 DOUBLE-CONTAINMENT PIPE AND FITTINGS

A. Double-Containment Piping - Flexible, Nonmetallic:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Franklin Fueling Systems]**
 - b. **[NOV Inc.]**
 - c. **[OPW Engineered Systems; a Dover company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Franklin Fueling Systems]**
 - b. **[NOV Inc.]**
 - c. **[OPW Engineered Systems; a Dover company]**
 - d. **<Insert manufacturer's name>**
3. Source Limitations: Obtain double-containment piping - flexible, nonmetallic, from single manufacturer.
4. Standard: Comply with UL 971.
5. Pipe Materials: PVDF complying with ASTM D3222 for carrier pipe with mechanical couplings to seal carrier, and PE pipe complying with ASTM D4976 for containment piping.
6. Sumps: **[Fiberglass][PE]**.
7. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.
8. Minimum Operating Pressure Rating: **10 psig (69 kPa)**.
9. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.
10. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.
11. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting

assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

B. Double-Containment Piping - Flexible, Metallic:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Franklin Fueling Systems]**
 - b. **[Omega Flex, Inc.]**
 - c. **[OPW Engineered Systems; a Dover company]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Franklin Fueling Systems]**
 - b. **[Omega Flex, Inc.]**
 - c. **[OPW Engineered Systems; a Dover company]**
 - d. **<Insert manufacturer's name>**
3. Source Limitations: Obtain double-containment piping - flexible, metallic, from single manufacturer.
4. Standard: Comply with UL 971A.
5. Pipe Materials:
 - a. Metallic Lining: ASTM A240/A240M, **[Type 304][Type 316]**, corrugated stainless steel tubing.
 - b. Carrier Pipe: Fluoropolymer tube.
 - c. Jacket: UV stabilized.
6. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.
7. Minimum Operating Pressure Rating: **10 psig (69 kPa)**.
8. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.
9. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.
10. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

C. Double-Containment Piping - Rigid:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Conley Composites; an Andronaco Industries Co.]**

- b. [Franklin Fueling Systems]
 - c. [NOV Inc.]
 - d. [PermAlert]
 - e. [Smith Fiberglass; a National Oilwell Varco brand]
 - f. [Tricon Piping Systems, Inc.]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Conley Composites; an Andronaco Industries Co.]
 - b. [Franklin Fueling Systems]
 - c. [NOV Inc.]
 - d. [PermAlert]
 - e. [Smith Fiberglass; a National Oilwell Varco brand]
 - f. [Tricon Piping Systems, Inc.]
 - g. <Insert manufacturer's name>
3. Source Limitations: Obtain double-containment piping - rigid, from single manufacturer.
4. Standard: Comply with UL 971.
5. RTRP: ASTM D2996 or ASTM D2997 carrier and containment piping and mechanical couplings to seal carrier and containment piping or individually bonded joints.
- a. Minimum Operating-Pressure Rating for RTRP NPS 2 and NPS 3 (DN 50 and DN 80): **150 psig (1035 kPa)**.
 - b. Minimum Operating-Pressure Rating for RTRP NPS 4 and NPS 6 (DN 100 and DN 150): **125 psig (860 kPa)**. Compliance with UL 971 is not required for **NPS 6 (DN 150)** and larger piping.
 - c. Fittings: RTRF complying with ASTM D2996 or ASTM D2997 and made by RTRP manufacturer; watertight sump entry boots, termination, or other end fittings.
6. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

2.4 PIPING SPECIALTIES

A. Flexible Connectors - Metallic:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [FLEX-ING, Inc]
 - b. [Flexicraft Industries]
 - c. [Hose Master, Inc]
 - d. [Hosecraft USA; a division of Flexicraft Industries]
 - e. [Kadant Unaflex, LLC]
 - f. [Metraflex Company (The)]
 - g. [Proco Products, Inc]
 - h. [UIP International, Inc]
 - i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[FLEX-ING, Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Hose Master, Inc]**
 - d. **[Hosecraft USA; a division of Flexicraft Industries]**
 - e. **[Kadant Unaflex, LLC]**
 - f. **[Metraflex Company (The)]**
 - g. **[Proco Products, Inc]**
 - h. **[UIP International, Inc]**
 - i. **<Insert manufacturer's name>**
3. Source Limitations: Obtain flexible connectors - metallic, from single manufacturer.
4. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.
5. Stainless steel bellows with woven, flexible, bronze or stainless steel, wire-reinforcing protective jacket.
6. Minimum Operating Pressure: **150 psig (1035 kPa)**.
7. End Connections: Socket, flanged, or threaded end to match connected piping.
8. Maximum Length: **30 inches (762 mm)**.
9. Swivel end, **50 psig (345 kPa)** maximum operating pressure.
10. Factory-furnished anode for connection to cathodic protection.

B. Flexible Connectors - Nonmetallic:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[FLEX-ING, Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Franklin Fueling Systems]**
 - d. **[Hosecraft USA; a division of Flexicraft Industries]**
 - e. **[Kadant Unaflex, LLC]**
 - f. **[Proco Products, Inc]**
 - g. **[UIP International, Inc]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[FLEX-ING, Inc]**
 - b. **[Flexicraft Industries]**
 - c. **[Franklin Fueling Systems]**
 - d. **[Hosecraft USA; a division of Flexicraft Industries]**
 - e. **[Kadant Unaflex, LLC]**
 - f. **[Proco Products, Inc]**
 - g. **[UIP International, Inc]**
 - h. **<Insert manufacturer's name>**
3. Source Limitations: Obtain flexible connectors - nonmetallic, from single manufacturer.

4. Listed and labeled for underground applications by an NRTL acceptable to authorities having jurisdiction.
5. PTFE bellows with woven, flexible, bronze or stainless steel, wire-reinforcing protective jacket.
6. Minimum Operating Pressure: **150 psig (1035 kPa)**.
7. End Connections: Socket, flanged, or threaded end to match connected piping.
8. Maximum Length: **30 inches (762 mm)**.
9. Swivel end, **50 psig (345 kPa)** maximum operating pressure.
10. Factory-furnished anode.

C. Strainers - Y-Pattern:

1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for **NPS 2 (DN 50)** and smaller; flanged ends for **NPS 2-1/2 (DN 65)** and larger.
3. Strainer Screen: **[60][80]**-mesh startup strainer and perforated stainless steel basket with 50 percent free area.
4. CWP Rating: **125 psig (860 kPa)**.

D. Strainers - Basket:

1. Body: ASTM A126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for **NPS 2 (DN 50)** and smaller; flanged ends for **NPS 2-1/2 (DN 65)** and larger.
3. Strainer Screen: **[60][80]**-mesh startup strainer and perforated stainless steel basket with 50 percent free area.
4. CWP Rating: **125 psig (860 kPa)**.

E. Strainers - T-Pattern:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: **[60][80]**-mesh startup strainer and perforated stainless steel basket with 57 percent free area.
4. CWP Rating: **750 psig (5170 kPa)**.

F. Air Vents - Manual:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: **NPS 1/2 (DN 15)**.
5. Discharge Connection: **NPS 1/8 (DN 6)**.
6. CWP Rating: **150 psig (1035 kPa)**.
7. Maximum Operating Temperature: **225 deg F (107 deg C)**.

2.5 JOINING MATERIALS

- A. Joint Compound and Tape for Threaded Joints: Suitable for fuel oil.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than **1000 deg F (540 deg C)** complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

- D. Bonding Adhesive for RTRP and RTRF: As recommended by piping and fitting manufacturer.

2.6 SPECIALTY VALVES

A. Pressure Relief Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anderson Greenwood; Pentair, Ltd.]**
 - b. **[Fulflo Specialties, Inc.]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **[Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anderson Greenwood; Pentair, Ltd.]**
 - b. **[Fulflo Specialties, Inc.]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **[Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtain pressure relief valves from single manufacturer.
4. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
5. Body: Brass, bronze, or cast steel.
6. Springs: Stainless steel, interchangeable.
7. Seat and Seal: NBR.
8. Orifice: Stainless steel, interchangeable.
9. Factory-Applied Finish: Baked enamel.
10. Maximum Inlet Pressure: **[150 psig (1035 kPa)]<Insert pressure>**.
11. Relief Pressure Setting: **[60 psig (414 kPa)]<Insert pressure>**.

B. Oil Safety Valves:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Anderson Greenwood; Pentair, Ltd.]**
 - b. **[Fulflo Specialties, Inc.]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **[Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Anderson Greenwood; Pentair, Ltd.]**
 - b. **[Fulflo Specialties, Inc.]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **[Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtains oil safety valves from single manufacturer.
 4. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
 5. Body: Brass, bronze, or cast steel.
 6. Springs: Stainless steel.
 7. Seat and Diaphragm: NBR.
 8. Orifice: Stainless steel, interchangeable.
 9. Factory-Applied Finish: Baked enamel.
 10. Manual override port.
 11. Maximum Inlet Pressure: **[60 psig (414 kPa)]<Insert pressure>**.
 12. Maximum Outlet Pressure: **[3 psig (21 kPa)]<Insert pressure>**.
- C. Emergency Shutoff Valves:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[EMCO Wheaton]**
 - b. **[Franklin Fueling Systems]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[EMCO Wheaton]**
 - b. **[Franklin Fueling Systems]**
 - c. **[OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company]**
 - d. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain emergency shutoff valves from single manufacturer.
 4. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
 5. **[Single][Double]** poppet valve.
 6. Body: ASTM A126, cast iron.
 7. Disk: FPM.
 8. Poppet Spring: Stainless steel.
 9. Stem: Plated brass.
 10. O-Ring: FPM.
 11. Packing Nut: PTFE-coated brass.
 12. Fusible link to close valve at **165 deg F (74 deg C)**.
 13. Thermal relief to vent line pressure buildup due to fire.
 14. Air test port.
 15. Maximum Operating Pressure: **0.5 psig (3.45 kPa)**.

2.7 MECHANICAL LEAK-DETECTION VALVES

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Franklin Fueling Systems]
2. [Red Jacket Pumps]
3. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [Franklin Fueling Systems]
2. [Red Jacket Pumps]
3. <Insert manufacturer's name>

C. Source Limitations: Obtain mechanical leak-detection valves from single manufacturer.

D. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.

E. Body: ASTM A126, cast iron.

F. O-Rings: Elastomeric compatible with fuel oil.

G. Piston and Stem Seals: PTFE.

H. Stem and Spring: Stainless steel.

I. Piston Cylinder: Burnished brass.

J. Indicated Leak Rate: Maximum [3 gph (3 mL/s)]<Insert leak rate> at [10 psig (69 kPa)]<Insert pressure>.

K. Leak Indication: Reduced flow.

2.8 LEAK-DETECTION AND MONITORING SYSTEM

A. Cable and Sensor Leak-Detection Monitoring System:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Caldwell Systems Corporation]
- b. [Containment Solutions, Inc]
- c. [Franklin Fueling Systems]
- d. [Gems Sensors & Controls Inc.]
- e. [Highland Tank & Manufacturing Company, Inc.]
- f. [In-Situ, Inc]
- g. [MSA Safety, Inc.]
- h. [Pentair Thermal Management]
- i. [PermAlert]
- j. [Pneumercator Inc]
- k. [Red Jacket Pumps]

- l. **[Veeder-Root Company (The)]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Caldwell Systems Corporation]**
 - b. **[Containment Solutions, Inc]**
 - c. **[Franklin Fueling Systems]**
 - d. **[Gems Sensors & Controls Inc.]**
 - e. **[Highland Tank & Manufacturing Company, Inc.]**
 - f. **[In-Situ, Inc]**
 - g. **[MSA Safety, Inc.]**
 - h. **[Pentair Thermal Management]**
 - i. **[PermAlert]**
 - j. **[Pneumercator Inc]**
 - k. **[Red Jacket Pumps]**
 - l. **[Veeder-Root Company (The)]**
 - m. **<Insert manufacturer's name>**
3. Source Limitations: Obtain cable and sensor leak-detection monitoring system from single manufacturer.
4. Standard: Comply with UL 1238.
5. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil piping.
6. Include fittings and devices required for testing.

2.9 LABELS AND IDENTIFICATION

- A. Detectable Warning Tape: Acid- and alkali-resistant PE-film warning tape manufactured for marking and identifying underground utilities, minimum of **6 inches (152 mm)** wide and **4 mils (0.1 mm)** thick, continuously inscribed with description of utility, with metallic core encased in a protective jacket for corrosion protection, and detectable by metal detector when tape is buried up to **30 inches (762 mm)** deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of fuel-oil piping.
- B. Examine installation of fuel-burning equipment and fuel-handling and storage equipment to verify actual locations of piping connections before installing fuel-oil piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.3 PREPARATION

- A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.
- B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.4 INSTALLATION OF OUTDOOR PIPING

- A. Underground Fuel-Oil Piping Burial Depth:
 - 1. Under Compacted Backfill: **[18 inches (457 mm)]<Insert dimension>** below finished grade.
 - 2. Under Asphalt 2 Inches (51 mm) Thick: **8 inches (203 mm)** below bottom of asphalt.
 - 3. Under 4 Inches (102 mm) of Reinforced Concrete in Areas Subject to Vehicle Traffic: **4 inches (102 mm)** below bottom of concrete.
 - 4. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
- B. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe, complying with protective coating manufacturer's written instructions. Review protective coating damage with Architect prior to repair.
 - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install double-containment, fuel-oil pipe at a minimum slope of 1 percent downward toward fuel-oil storage tank sump.
- D. Install vent pipe at a minimum slope of 2 percent downward toward fuel-oil storage tank sump.
- E. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquidtight joints.
- F. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to aboveground storage tanks and underground storage tanks.
- G. Install fittings for changes in direction in rigid pipe.
- H. Install system components with pressure rating equal to or greater than system operating pressure.

3.5 INSTALLATION OF INDOOR PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles

or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- E. Install piping above accessible ceilings at a height that allows sufficient space for ceiling panel removal.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Comply with requirements for equipment specifications for roughing-in requirements.
- I. Conceal pipe installations in walls, pipe spaces, or utility spaces; above ceilings; below grade or floors; and in floor channels unless indicated to be exposed to view.
- J. Prohibited Locations:
 - 1. Do not install fuel-oil piping in or through HVAC ducts and plenums, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - 2. Do not install fuel-oil piping in solid walls or partitions.
- K. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- L. Connect branch piping from top or side of horizontal piping.
- M. Install unions in pipes **NPS 2 (DN 50)** and smaller at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.
- N. Do not use fuel-oil piping as grounding electrode.
- O. Install sleeves and sleeve seals for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.6 INSTALLATION OF VALVES

- A. Install manual fuel-oil shutoff valves on branch connections to fuel-oil appliance.
- B. Install valves in accessible locations.
- C. Install oil safety valves at inlet of each oil-fired appliance.
- D. Install pressure relief valves in distribution piping between the supply and return lines.
- E. Install one-piece, bronze ball valve with hose end connection at low points in fuel-oil piping. Comply with requirements in Section 230523.12 "Ball Valves for HVAC Piping."
- F. Install manual air vents at high points in fuel-oil piping.
- G. Install emergency shutoff valves at dispensers.

3.7 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints: Construct joints in accordance with AWS D10.12/D10.12M, using qualified processes and welding operators in accordance with "Quality Assurance" Article.
 - 1. Bevel plain ends of steel pipe.
 - 2. Patch factory-applied protective coating as recommended in writing by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," Ch. 35, "Pipe and Tubing."
- F. Flanged Joints: Install gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.
- G. Flared Joints: Comply with SAE J513. Tighten finger tight, and then use wrench in accordance with fitting manufacturer's written instructions. Do not overtighten.
- H. Fiberglass-Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join in accordance with pipe manufacturer's written instructions.

3.8 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- C. Install hangers for **[steel piping][and][copper tubing]**, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping within **[12 inches (300 mm)]<Insert dimension>** of each fitting and coupling.
- E. Support vertical runs of **[copper tube][and][steel piping]** to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.9 INSTALLATION OF LEAK-DETECTION AND MONITORING SYSTEM

- A. Install leak-detection and monitoring system. Install alarm panel inside building where indicated.
- B. Double-Containment, Fuel-Oil Piping: Install leak-detection sensor **[probes at low points in piping][cable probes in interstitial space of double-containment piping]**.

3.10 PIPING CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.
- B. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.
- C. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
- D. Connect piping to equipment with shutoff valve and union. Install union between valve and equipment.
- E. Install flexible piping connectors at final connection to burners, oil-fired appliances, and day tanks.

3.11 LABELING AND IDENTIFYING

- A. Nameplates, pipe identification, valve tags, and signs are specified in Section 230553 "Identification for HVAC Piping and Equipment."
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.
 - 1. Text: In addition to identifying unit, distinguish between multiple units; inform operator of operational requirements; indicate safety and emergency precautions; and warn of hazards and improper operations.
- C. Install detectable warning tape directly above buried fuel-oil piping, **[12 inches (304 mm)]<Insert dimension>** below finished grade, except **[6 inches (152 mm)]<Insert dimension>** below subgrade under pavements and slabs. Terminate tracer wire in an accessible area, and identify as "tracer wire" for future use with plastic-laminate sign.
 - 1. Piping: Over underground fuel-oil distribution piping.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer Field Services: Engage a factory-authorized service representative to **[support][supervise]** field tests and inspections.
- C. Tests and Inspections:
 - 1. Piping Pressure Test: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system.

- a. Fuel-Oil Distribution Piping:
 - 1) Hydrostatic: Minimum 150 percent of maximum anticipated pressure or **[5 psig (35 kPa)]<Insert dimension>**.
 - 2) Pneumatic: Minimum 110 percent of maximum anticipated pressure.
 - 3) Pressure to be maintained while complete visual inspection of all joints and connections is conducted.
 - 4) In no case is test pressure to be less than a gauge pressure of **5 psi (35 kPa)** measured at the highest point of the system.
 - 5) In no case is test pressure to be maintained for less than 10 minutes.
 - b. Fuel-Oil, Double-Containment Piping:
 - 1) Carrier Pipe: Same as "Fuel-Oil Distribution Piping" Subparagraph above.
 - 2) Containment Conduit: Minimum **[5 psig (35 kPa)]<Insert dimension>** for minimum **[60]<Insert time>** minutes.
 - c. Suction Piping: Minimum **20 in. Hg (500 mm Hg)** for minimum **[30]<Insert time>** minutes.
 - d. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed **10 psig (69 kPa)**.
- D. Inspect and test fuel-oil piping in accordance with NFPA 31, "Tests of Piping" Paragraph; and in accordance with requirements of authorities having jurisdiction.
 - E. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.
 - F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - G. Bleed air from fuel-oil piping using manual air vents.
 - H. Fuel-oil piping and equipment will be considered defective if they do not pass tests and inspections.
 - I. Prepare test and inspection reports.

3.13 OUTDOOR PIPING SCHEDULE

- A. All underground fuel-oil piping is to be installed in containment piping.
- B. Underground Fuel-Oil Piping: **[Flexible][Rigid]**, double-containment piping. Size indicated is carrier-pipe size.
- C. Underground fuel-oil-tank fill and vent piping to be the following:
 - 1. NPS 2 (DN 50) Pipe Size and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints. Coat pipe and fittings with protective coating for steel piping.
 - 2. NPS 2-1/2 (DN 65) Pipe Size and Larger: Steel pipe, steel welding fittings, and welded joints. Coat pipe and fittings with protective coating for steel piping.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- E. Aboveground fuel-oil piping to be the following:

1. NPS 2 (DN 50) Pipe Size and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
2. NPS 2-1/2 (DN 65) Pipe Size and Larger: Steel pipe, steel welding fittings, and welded joints.
3. **[Annealed][Drawn]**-temper copper tube with wrought-copper fittings and brazed joints.
4. Stainless steel pipe with **[grooved][press]** joints.

3.14 INDOOR PIPING SCHEDULE

A. Aboveground fuel-oil piping to be the following:

1. NPS 1/2 (DN 15) Pipe Size and Smaller: **[Steel pipe with threaded joints][Annealed-temper copper pipe, wrought copper fittings, and brazed or flared joints]**.
2. NPS 5/8 to NPS 2 (DN 18 to DN 50): **[Steel pipe, steel or malleable-iron threaded fittings, and threaded joints][Drawn-temper copper pipe, wrought copper fittings, and brazed joints]**.
3. NPS 2-1/2 (DN 65) Pipe Size and Larger: **[Steel pipe, steel fittings, and welded or flanged joints][Drawn-temper copper pipe, wrought copper fittings, and brazed or flanged joints]**.

3.15 SHUTOFF VALVE SCHEDULE

A. Valves for aboveground distribution piping NPS 2 (DN 50) and smaller to be the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, **[full][regular]**-port, bronze ball valves with bronze trim.

B. Distribution piping valves for pipe NPS 2-1/2 (DN 65) and larger to be the following:

1. Two-piece, **[full][regular]**-port, bronze ball valves with bronze trim.
2. Bronze, **[nonlubricated][lubricated]** plug valve.

C. Valves in branch piping for single appliance to be the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, **[full][regular]**-port, bronze ball valves with bronze trim.

END OF SECTION 22 12 23 26



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Task	Specification	Specification Description
22 12 23 26	22 12 23 00	Facility Indoor Potable-Water Storage Tanks



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SECTION 22 13 00 00 - FACILITY GRAY-WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel, pressure, water storage tank.
2. Steel, nonpressure, water storage tank.
3. Insulated, steel, water storage tanks.
4. Plastic, pressure, water storage tank.
5. Plastic, nonpressure, water storage tanks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for gray-water storage tanks.
2. Include rated capacities, operating characteristics, **[electrical characteristics,]**and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of **<Insert portion of Work>**.
4. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For facility gray-water storage tanks.

1. Include design calculations for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **[manufacturer][fabricator]**.

B. Seismic Qualification Certificates: For gray-water storage tanks, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- C. Welding certificates.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For gray-water storage tanks to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employ a qualified structural engineer to prepare calculations, Shop Drawings, and other structural data for fabrication and erection of surface water-storage tanks.
 - 1. Engineering Responsibility: Preparation of data for surface water-storage tanks, accessories, specified appurtenances, and concrete supports and foundations, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.4/D1.4M, "Structural Welding Code - Reinforced Steel."
- C. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design facility gray-water storage tanks.
- B. Structural Performance: Surface water-storage tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of dead and live gravity loads and winds of **[100 mph (161 km/h)]<Insert value>**.
- C. Seismic Performance: Surface water-storage tank, including structural reinforcement and foundation, withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Component Importance Factor: **[1.5][1.0]**.
- D. Thermal Movements: Surface water-storage tank, including structural reinforcement and foundation, shall allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: [120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>.

- E. Comply with AWWA D100, "Welded Steel Tanks for Water Storage," and with AWWA M42, "Steel Water-Storage Tanks."
- F. Comply with AWWA D110, "Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks."
- G. Comply with AWWA D110, "Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks."
- H. Comply with AWWA D115, "Tendon-Prestressed Concrete Water Tanks."
- I. Comply with AWWA D120, "Thermosetting Fiberglass-Reinforced Plastic Tanks."

2.2 STEEL, PRESSURE, WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [A. O. Smith Corporation]
2. [Adamson Global Technology]
3. [Aldrich Company, Inc. (The)]
4. [Bradford White Corporation]
5. [Cemline Corporation]
6. [Flo Fab Inc]
7. [Green Boiler Technologies]
8. [GSW Water Heating]
9. [HESCO Bastion Ltd.]
10. [Lochinvar, LLC]
11. [Precision Boilers]
12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A. O. Smith Corporation]
2. [Adamson Global Technology]
3. [Aldrich Company, Inc. (The)]
4. [Bradford White Corporation]
5. [Cemline Corporation]
6. [Flo Fab Inc]
7. [Green Boiler Technologies]
8. [GSW Water Heating]
9. [HESCO Bastion Ltd.]
10. [Lochinvar, LLC]
11. [Precision Boilers]

12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

- C. Description: Steel, [horizontal][vertical], pressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: [ASME code, steel][Steel], constructed with nontoxic welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.
- F. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter; same pressure rating as tank.
- G. Tappings: Factory-fabricated[stainless] steel, welded to tank[before testing and labeling].
 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- H. Specialties and Accessories: Include tappings in tank and the following:
 1. Pressure relief valve.
 2. Pressure gage.
 3. Thermometer.
 4. Air-charging connection.
 5. Gage glass, brass fittings, compression stops, and gage-glass guard.
- I. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank[before testing and labeling].
- J. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[before testing and labeling].
- K. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.

2.3 STEEL, NONPRESSURE, WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Adamson Global Technology]
 2. [Highland Tank & Manufacturing Company, Inc.]
 3. [RECO USA]
 4. [Steel Tank and Fabricating Corporation (STAFCO)]
 5. [Wood, John Co]

6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Adamson Global Technology]
 2. [Highland Tank & Manufacturing Company, Inc.]
 3. [RECO USA]
 4. [Steel Tank and Fabricating Corporation (STAFCO)]
 5. [Wood, John Co]
 6. <Insert manufacturer's name>
- C. Description: Steel, [horizontal][vertical], nonpressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: Steel, constructed with nontoxic welded joints.
- F. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter.
- G. Cover for Open Tank: [Plastic][Steel, with lining same as or similar to tank lining and] with shape that encloses top of tank.
- H. Tappings: Factory-fabricated[stainless] steel, welded to tank.
1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- I. Specialties and Accessories: Include tappings in tank and the following:
1. Vacuum relief valve.
 2. Free air vent with insect screen.
 3. Thermometer.
 4. Gage glass, brass fittings, compression stops, and gage-glass guard.
- J. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank[before testing and labeling].
- K. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[before testing and labeling].
- L. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.
- 2.4 INSULATED, STEEL, WATER STORAGE TANKS
- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [A. O. Smith Corporation]
 2. [GSW Water Heating]
 3. [HESCO Bastion Ltd.]

4. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
5. [Lochinvar, LLC]
6. [Precision Boilers]
7. [PVI; A WATTS Brand]
8. [RBI]
9. [State Industries]
10. [Vaughn Thermal Corporation]
11. [Wessels Company]
12. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A. O. Smith Corporation]
2. [GSW Water Heating]
3. [HESCO Bastion Ltd.]
4. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
5. [Lochinvar, LLC]
6. [Precision Boilers]
7. [PVI; A WATTS Brand]
8. [RBI]
9. [State Industries]
10. [Vaughn Thermal Corporation]
11. [Wessels Company]
12. <Insert manufacturer's name>

C. Description: Steel, vertical, pressure-rated tank with cylindrical sidewalls.

D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.

E. Construction: [ASME code, steel][Steel], constructed with nontoxic welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.

F. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter; same pressure rating as tank.

G. Tappings: Factory-fabricated[stainless] steel, welded to tank[before testing and labeling].

1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.

H. Specialties and Accessories: Include tappings in tank and the following:

1. Pressure relief valve.
2. Pressure gage.
3. Thermometer.
4. Air-charging connection.
5. Gage glass, brass fittings, compression stops, and gage-glass guard.

I. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[before testing and labeling].

J. Insulation: Factory-installed fiberglass or polyurethane foam; surrounding entire tank except connections and other openings; suitable for tank operating temperature; and complying with

ASHRAE/IES 90.1.

- K. Jacket: Steel, with manufacturer's standard finish unless otherwise indicated.

2.5 PLASTIC, PRESSURE, WATER STORAGE TANKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Pentair, Inc.]**
2. **[Tankinetics, Inc]**
3. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Pentair, Inc.]**
2. **[Tankinetics, Inc]**
3. **<Insert manufacturer's name>**

- C. Description: FRP, vertical, pressure-rated tank with cylindrical sidewalls.

- D. Construction: **[ASME code, composite FRP][Composite FRP], [contact-molded][or][filament-wound]**, thermosetting-resin tank for **[100-psig (690-kPa)][125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value>** working pressure.

- E. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter; same pressure rating as tank.

- F. Tappings: Factory-fabricated, FRP flanged-end nozzle.

1. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.

- G. Specialties and Accessories: Include tappings in tank and the following:

1. Pressure relief valve.
2. Pressure gage.
3. Thermometer.

- H. Vertical Tank Supports: Factory-fabricated steel legs or FRP skirt attached by FRP brackets to tank sidewall.

2.6 PLASTIC, NONPRESSURE, WATER STORAGE TANKS

- A. FRP Water Storage Tanks:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Amprotec, Inc.]
 - b. [Belding Tank Technologies, Inc]
 - c. [L. F. Manufacturing, Inc]
 - d. [Palmer Manufacturing and Tank Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amprotec, Inc.]
 - b. [Belding Tank Technologies, Inc]
 - c. [L. F. Manufacturing, Inc]
 - d. [Palmer Manufacturing and Tank Company]
 - e. <Insert manufacturer's name>
 3. Description: FRP, vertical, nonpressure-rated water tank.
 4. Construction: [ASTM D3299, filament-wound][or][ASTM D4097, contact-molded] FRP.
 5. Tappings: Factory-fabricated, FRP flanged-end nozzle.
 - a. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
 - 1) [Exception: Tappings may be threaded FRP coupling integral with nozzle for connections for plastic piping.]
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting tank.
- B. PE Water Storage Tanks:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amprotec, Inc.]
 - b. [Assmann Corporation of America]
 - c. [Chem-Tainer Industries]
 - d. [Poly Processing Company]
 - e. [Premier Plastics Inc.]
 - f. [Snyder Industries, Inc.]
 - g. [Steel Tank and Fabricating Corporation (STAFCO)]
 - h. [TolPlast Company, Inc.]
 - i. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amprotec, Inc.]
 - b. [Assmann Corporation of America]
 - c. [Chem-Tainer Industries]
 - d. [Poly Processing Company]

- e. **[Premier Plastics Inc.]**
 - f. **[Snyder Industries, Inc.]**
 - g. **[Steel Tank and Fabricating Corporation (STAFCO)]**
 - h. **[TolPlast Company, Inc.]**
 - i. **<Insert manufacturer's name>**
- 3. Description: PE, vertical, flat-bottom, nonpressure-rated water tank.
 - 4. Construction: ASTM D1998, molded PE.
 - 5. Tappings: Factory-fabricated bulkhead fittings attached to tank.
 - a. NPS 2 (DN 50) and Smaller: With female thread.
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 - 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting entire bottom of tank.
- C. Manhole: Watertight, for tank more than **[36 inches (915 mm)]<Insert dimension>** in diameter.
- D. Cover for Open Tank: Plastic, same as or similar to tank material and with shape that encloses top of tank.
- E. Specialties and Accessories: Include tappings in tank and the following:
- 1. Vacuum relief valve.
 - 2. Free air vent with insect screen.
 - 3. Thermometer.
 - 4. Gage glass, brass fittings, compression stops, and gage-glass guard.

2.7 PAINT MATERIALS

- A. Paint: Comply with AWWA D102.
- B. Primer: Tank fabricator's standard epoxy-polyamide paint.
- C. Tank Shell Exterior Intermediate Paint: Tank fabricator's standard, two-component epoxy paint compatible with prime and finish paint. Intermediate coat shall have a slight color contrast with finish coat.
- D. Tank Shell Exterior Finish Paint: Tank fabricator's standard urethane paint.
 - 1. Color: **[As selected by Owner from tank manufacturer's paint chart]<Insert color>**.

2.8 SHOP PAINTING

- A. Tank Shell Exterior Finish Coat: Factory coating according to AWWA D103.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install water storage tanks on concrete bases, level and plumb, firmly anchored. Arrange so devices

needing servicing are accessible.

1. Install horizontal tanks on [**concrete piers and factory-fabricated**][**fabricated steel supports and**] saddles.

B. Vertical Water Storage Tanks:

1. Install on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

C. Anchor tank supports and tanks to substrate.

1. Use steel or FRP straps over or around plastic tanks.

D. Install tank seismic restraints.

E. Install thermometers and pressure gages on water storage tanks and piping if indicated. Thermometers and pressure gages are specified in Section 220500 "Common Work Results for Plumbing."

F. Install the following devices on tanks:

1. Pressure relief valves.
2. Temperature and pressure relief valves.
3. Vacuum relief valves.
4. Tank vents on nonpressure tanks.
5. Connections to accessories.

G. After installing tanks with factory finish, inspect finishes and repair damages to finishes.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:

1. Tank Weld Test: Use radiographic method according to AWWA D100. Repair failures and retest.
2. Leak Test, AWWA D100: Comply with AWWA D100[**and NFPA 22**]. Fill tanks with water and test for leaks after installation. Repair leaks and retest until no leaks exist.
 - a. Water will be furnished by Owner.
3. Leak Test: Comply with [**AWWA D110**][**AWWA D115**][**and NFPA 22**]. Fill tanks with water and test for leaks after installation. Repair leaks and retest until no leaks exist.
 - a. Water will be furnished by Owner.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Water storage tanks will be considered defective if they do not pass test and inspections.

C. Prepare test and inspection reports.



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Task	Specification	Specification Description
22 13 13 00	22 13 00 00	Facility Gray-Water Storage Tanks



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SECTION 22 13 16 00 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized-steel pipe and fittings.
4. Stainless steel drainage pipe and fittings.
5. Ductile-iron pipe and fittings.
6. Copper tube and fittings.
7. ABS pipe and fittings.
8. PVC pipe and fittings.
9. Specialty pipe fittings.
10. Encasement for underground metal piping.

B. Related Requirements:

1. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.
2. Section 226600 "Chemical-Waste Systems for Laboratory and Healthcare Facilities" for chemical-waste and vent piping systems.
3. Section 333115 "Site Sanitary Sewerage Piping" for sanitary sewerage piping and structures outside the building.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

C. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

- C. Field quality-control reports.

1.4 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
 - 1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[two]<Insert number>** days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without **[Architect's][Construction Manager's][Owner's]** written permission.

1.5 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: **[10 ft. head of water (30 kPa head of water)]<Insert pressure>**.
 - 2. Waste, Force-Main Piping: **[50 psig (345 kPa)][100 psig (690 kPa)][150 psig (1035 kPa)]<Insert pressure>**.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment":
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified **[and the unit will be fully operational after the seismic event].**"
 - 2. Component Importance Factor: **[1.5][1.0]**.
- C. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[AB & I Foundry; a part of the McWane family of companies]**
 2. **[Charlotte Pipe and Foundry Company]**
 3. **[Tyler Pipe; a part of the McWane family of companies]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[AB & I Foundry; a part of the McWane family of companies]**
 2. **[Charlotte Pipe and Foundry Company]**
 3. **[Tyler Pipe; a part of the McWane family of companies]**
 4. **<Insert manufacturer's name>**
- C. Pipe and Fittings:
1. Marked with CISPI collective trademark.
 2. ASTM A74, **[service][and][extra-heavy]** cast iron.
- D. Gaskets: ASTM C564, rubber.
- E. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[AB & I Foundry; a part of the McWane family of companies]**
 2. **[Charlotte Pipe and Foundry Company]**
 3. **[Tyler Pipe; a part of the McWane family of companies]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[AB & I Foundry; a part of the McWane family of companies]**
 2. **[Charlotte Pipe and Foundry Company]**
 3. **[Tyler Pipe; a part of the McWane family of companies]**
 4. **<Insert manufacturer's name>**
- C. Pipe and Fittings:
1. Marked with CISPI collective trademark.
 2. ASTM A888 or CISPI 301.
- D. Single-Stack Aerator Fittings: ASME B16.45, hubless, cast-iron aerator and deaerator drainage fittings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Conine Manufacturing Co., Inc]**
 - b. **[SE Sovent]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Conine Manufacturing Co., Inc]**
 - b. **[SE Sovent]**
 - c. **<Insert manufacturer's name>**

E. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ANACO-Husky; a part of the McWane family of companies]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[Dallas Specialty & Mfg. Co.]**
 - d. **[Fernco Inc]**
 - e. **[Ideal Tridon Group]**
 - f. **[Matco-Norca]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ANACO-Husky; a part of the McWane family of companies]**
 - b. **[Charlotte Pipe and Foundry Company]**
 - c. **[Dallas Specialty & Mfg. Co.]**
 - d. **[Fernco Inc]**
 - e. **[Ideal Tridon Group]**
 - f. **[Matco-Norca]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
3. Standards: ASTM C1277 and CISPI 310.
4. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

F. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[AB & I Foundry; a part of the McWane family of companies]**
 - b. **[ANACO-Husky; a part of the McWane family of companies]**
 - c. **[Charlotte Pipe and Foundry Company]**
 - d. **[Clamp-All Corp]**
 - e. **[Dallas Specialty & Mfg. Co.]**
 - f. **[Ideal Tridon Group]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[AB & I Foundry; a part of the McWane family of companies]**
 - b. **[ANACO-Husky; a part of the McWane family of companies]**
 - c. **[Charlotte Pipe and Foundry Company]**
 - d. **[Clamp-All Corp]**
 - e. **[Dallas Specialty & Mfg. Co.]**
 - f. **[Ideal Tridon Group]**
 - g. **[MIFAB, Inc]**
 - h. **[Mission Rubber Company, LLC]**
 - i. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - j. **<Insert manufacturer's name>**
3. Standards: ASTM C1277 and ASTM C1540. **<Insert standard>**.
4. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[U.S. Steel]**
 2. **[Wheatland Tube; Zekelman Industries]**
 3. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[U.S. Steel]**
 2. **[Wheatland Tube; Zekelman Industries]**
 3. **<Insert manufacturer's name>**
- C. Galvanized-Steel Pipe: ASTM A53/A53M, Type E, standard-weight cast iron. Include square-cut-grooved or threaded ends matching joining method.

- D. Cast-Iron Drainage Fittings: **[Galvanized;]**ASME B16.12, threaded.
- E. Steel Pipe Pressure Fittings:
 - 1. Steel Pipe Nipples: **[Galvanized;]**ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 - 3. Gray-Iron, Threaded Fittings: **[Galvanized;]**ASME B16.4, Class 125, standard pattern.
- F. Cast-Iron Flanges: ASME B16.1, Class 125.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- G. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **[Smith-Cooper International]**
 - e. **[Star Pipe Products]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - c. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - d. **[Smith-Cooper International]**
 - e. **[Star Pipe Products]**
 - f. **[Victaulic Company]**
 - g. **<Insert manufacturer's name>**
 - 3. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A536, ductile-iron castings; ASTM A47/A47M, malleable-iron castings; ASTM A234/A234M, forged steel fittings; or ASTM A106/A106M, steel pipes with dimensions matching ASTM A53/A53M, steel pipe, and complying with AWWA C606 for grooved ends.
 - 4. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F1476, Type I. Include ferrous housing sections with continuous curved keys, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.

2.6 STAINLESS STEEL DRAINAGE PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide**

products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. [Anvil; an ASC Engineered Solution]
 2. [BLÜCHER; A Watts Water Technologies Company]
 3. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [Anvil; an ASC Engineered Solution]
 2. [BLÜCHER; A Watts Water Technologies Company]
 3. <Insert manufacturer's name>
- C. Description: Comply with requirements of ASME A112.3.1 drainage pattern.
- D. Material: [Type 304 stainless steel][Type 316L stainless steel][Type 304 or 316L stainless steel].
- E. Pipe Construction: Seamless.
- F. Internal Sealing Rings: [EPDM][NBR]<Insert material>[, marked or color-coded for the application].
- G. Joints: Single or double, socket and spigot ends.

2.7 DUCTILE-IRON PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [American Cast Iron Pipe Company]
 2. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 3. [McWane Ductile; a part of the McWane family of companies]
 4. [U.S. Pipe]
 5. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. [American Cast Iron Pipe Company]
 2. [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 3. [McWane Ductile; a part of the McWane family of companies]
 4. [U.S. Pipe]
 5. <Insert manufacturer's name>
- C. Ductile-Iron, Mechanical-Joint Piping:
1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot ends unless grooved or flanged ends are indicated.
 2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

- D. Ductile-Iron, Push-on-Joint Piping:
1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot ends unless grooved or flanged ends are indicated.
 2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 3. Gaskets: AWWA C111/A21.11, rubber.
- E. Ductile-Iron, Grooved-Joint Piping: AWWA C151/A21.51, with round-cut-grooved ends in accordance with AWWA C606.
- F. Ductile-Iron, Grooved-End Pipe Appurtenances:
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Smith-Cooper International]**
 - d. **[Star Pipe Products]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Anvil; an ASC Engineered Solution]**
 - b. **[Shurjoint; a part of Aalberts Integrated Piping Systems]**
 - c. **[Smith-Cooper International]**
 - d. **[Star Pipe Products]**
 - e. **[Victaulic Company]**
 - f. **<Insert manufacturer's name>**
 3. Grooved-End, Ductile-Iron Fittings: ASTM A536, ductile-iron castings, with dimensions matching AWWA C110/A 21.10, ductile-iron pipe or AWWA C153/A 21.53, ductile-iron fittings, and complying with AWWA C606 for grooved ends.
 4. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F1476, Type I. Include ferrous housing sections with continuous curved keys, EPDM-rubber center-leg gasket suitable for hot and cold water, and bolts and nuts.

2.8 COPPER TUBE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
1. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 2. **[Cambridge-Lee Industries, LLC]**
 3. **[Cerro Flow Products, LLC]**
 4. **[Wieland Copper Products, LLC]**
 5. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 2. **[Cambridge-Lee Industries, LLC]**
 3. **[Cerro Flow Products, LLC]**
 4. **[Wieland Copper Products, LLC]**
 5. **<Insert manufacturer's name>**
- C. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.
- D. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- E. Hard Copper Tube: **ASTM B88, Type L and Type M (ASTM B88M, Type B and Type C)**, water tube, drawn temper.
- F. Soft Copper Tube: **ASTM B88, Type L (ASTM B88M, Type B)**, water tube, annealed temper.
- G. Copper Pressure Fittings:
1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- H. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- I. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.9 ABS PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[Charlotte Pipe and Foundry Company]**
 2. **[JM Eagle]**
 3. **[Royal Building Products, a Westlake Company]**
 4. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. **[Charlotte Pipe and Foundry Company]**
 2. **[JM Eagle]**
 3. **[Royal Building Products, a Westlake Company]**
 4. **<Insert manufacturer's name>**
- C. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic

drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

- D. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
- E. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.
- F. ABS Socket Fittings: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.
- G. Solvent Cement: ASTM D2235.
 - 1. Product Data: Verify ABS solvent cement has a VOC content of 325 g/L or less.
 - 2. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 4. Verify solvent cement complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.10 PVC PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[GF Piping Systems]**
 - 4. **[JM Eagle]**
 - 5. **[National Pipe and Plastic, Inc. (Oldcastle)]**
 - 6. **[North America Pipe Corporation]**
 - 7. **[Rocky Mountain Colby Pipe Company]**
 - 8. **[Silver-line Plastics]**
 - 9. **<Insert manufacturer's name>**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1. **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - 2. **[Charlotte Pipe and Foundry Company]**
 - 3. **[GF Piping Systems]**
 - 4. **[JM Eagle]**
 - 5. **[National Pipe and Plastic, Inc. (Oldcastle)]**
 - 6. **[North America Pipe Corporation]**
 - 7. **[Rocky Mountain Colby Pipe Company]**
 - 8. **[Silver-line Plastics]**
 - 9. **<Insert manufacturer's name>**

- C. Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" marking for plastic sewer piping.
- D. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.
- E. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.
- F. PVC Socket Fittings: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- G. Adhesive Primer: ASTM F656.
 - 1. Product Data: Verify adhesive primer has a VOC content of 550 g/L or less.
 - 2. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 4. Product Data: Verify adhesive primer complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.
- H. Solvent Cement: ASTM D2564.
 - 1. Product Data: Verify PVC welding solvent cement has a VOC content of 510 g/L or less.

2.11 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Unshielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) **[Dallas Specialty & Mfg. Co.]**
 - 2) **[Fernco Inc]**
 - 3) **[Mission Rubber Company, LLC]**
 - 4) **[Plastic Oddities]**
 - 5) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) [Dallas Specialty & Mfg. Co.]
 - 2) [Fernco Inc]
 - 3) [Mission Rubber Company, LLC]
 - 4) [Plastic Oddities]
 - 5) <Insert manufacturer's name>
- c. Standard: ASTM C1173.
- d. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- e. End Connections: Same size as and compatible with pipes to be joined.
- f. Sleeve Materials:
- 1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
 - 2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
 - 3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- 1) [Cascade Waterworks Mfg. Co.]
 - 2) [Mission Rubber Company, LLC]
 - 3) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [Cascade Waterworks Mfg. Co.]
 - 2) [Mission Rubber Company, LLC]
 - 3) <Insert manufacturer's name>
- c. Standard: ASTM C1460.
- d. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- e. End Connections: Same size as and compatible with pipes to be joined.
5. Pressure Transition Couplings:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- 1) [Apollo Valves; a part of Aalberts Integrated Piping Systems]
 - 2) [Cascade Waterworks Mfg. Co.]
 - 3) [EBAA Iron Sales, Inc.]
 - 4) [Ford Meter Box Company, Inc. (The)]
 - 5) [JCM Industries, Inc]
 - 6) [Romac Industries, Inc.]
 - 7) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- 1) **[Apollo Valves; a part of Aalberts Integrated Piping Systems]**
 - 2) **[Cascade Waterworks Mfg. Co.]**
 - 3) **[EBAA Iron Sales, Inc.]**
 - 4) **[Ford Meter Box Company, Inc. (The)]**
 - 5) **[JCM Industries, Inc]**
 - 6) **[Romac Industries, Inc.]**
 - 7) **<Insert manufacturer's name>**
- c. Standard: AWWA C219.
- d. Description: Metal sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
- e. Center-Sleeve Material: **[Manufacturer's standard][Carbon steel][Stainless steel][Ductile iron][Malleable iron]**.
- f. Gasket Material: Natural or synthetic rubber.
- g. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[A.Y. McDonald Mfg. Co.]**
 - 2) **[Capitol Manufacturing Company]**
 - 3) **[GF Piping Systems: Georg Fischer LLC]**
 - 4) **[HART Industrial Unions, LLC]**
 - 5) **[Jomar Valve]**
 - 6) **[Matco-Norca]**
 - 7) **[WATTS; A Watts Water Technologies Company]**
 - 8) **[Wilkins]**
 - 9) **[Zurn Industries, LLC]**
 - 10) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) **[A.Y. McDonald Mfg. Co.]**
 - 2) **[Capitol Manufacturing Company]**
 - 3) **[GF Piping Systems: Georg Fischer LLC]**
 - 4) **[HART Industrial Unions, LLC]**
 - 5) **[Jomar Valve]**
 - 6) **[Matco-Norca]**
 - 7) **[WATTS; A Watts Water Technologies Company]**
 - 8) **[Wilkins]**
 - 9) **[Zurn Industries, LLC]**
 - 10) **<Insert manufacturer's name>**

- c. Description:
- 1) Standard: ASSE 1079.
 - 2) Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][250 psig (1725 kPa)]<Insert pressure>.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- 1) [Capitol Manufacturing Company]
 - 2) [GF Piping Systems: Georg Fischer LLC]
 - 3) [Matco-Norca]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- 1) [Capitol Manufacturing Company]
 - 2) [GF Piping Systems: Georg Fischer LLC]
 - 3) [Matco-Norca]
 - 4) [WATTS; A Watts Water Technologies Company]
 - 5) [Zurn Industries, LLC]
 - 6) <Insert manufacturer's name>
- c. Description:
- 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][175 psig (1200 kPa)][300 psig (2070 kPa)]<Insert pressure>.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- 1) [Advance Products & Systems, LLC]
 - 2) [CALPICO, Inc.]
 - 3) [GF Piping Systems: Georg Fischer LLC]
 - 4) [GPT; a division of EnPRO Industries]
 - 5) <Insert manufacturer's name>
- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Advance Products & Systems, LLC]
- 2) [CALPICO, Inc.]
- 3) [GF Piping Systems: Georg Fischer LLC]
- 4) [GPT; a division of EnPRO Industries]
- 5) <Insert manufacturer's name>

c. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: [150 psig (1035 kPa)]<Insert pressure>.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Anvil; an ASC Engineered Solution]
- 2) [Elster Perfection; Honeywell]
- 3) [Matco-Norca]
- 4) [Precision Plumbing Products]
- 5) [Victaulic Company]
- 6) <Insert manufacturer's name>

b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Anvil; an ASC Engineered Solution]
- 2) [Elster Perfection; Honeywell]
- 3) [Matco-Norca]
- 4) [Precision Plumbing Products]
- 5) [Victaulic Company]
- 6) <Insert manufacturer's name>

c. Description:

- 1) Standard: IAPMO PS 66.
- 2) Electroplated steel nipple.
- 3) Pressure Rating: [300 psig (2070 kPa) at 225 deg F (107 deg C)]<Insert pressure and temperature>.
- 4) End Connections: Male threaded or grooved.
- 5) Lining: Inert and noncorrosive, propylene.

2.12 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A674 or AWWA C105/A 21.5.

- B. Material: **[Linear low-density polyethylene film of 0.008-inch (0.20-mm)][or][high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm)]** minimum thickness.
- C. Form: **[Sheet][or][tube]**.
- D. Color: **[Black][or][natural]<Insert color>**.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in **[Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"]****[Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment"]**.
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

- a. Straight tees, elbows, and crosses may be used on vent lines.
- 3. Do not change direction of flow more than 90 degrees.
- 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- L. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: Two percent downward in direction of flow for piping **NPS 3 (DN 80)** and smaller; **[1][2]<Insert number>** percent downward in direction of flow for piping **NPS 4 (DN 100)** and larger.
 - 2. Horizontal Sanitary Waste Piping: **[Two]<Insert number>** percent downward in direction of flow.
 - 3. Vent Piping: **[One]<Insert number>** percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.
- O. Install steel piping in accordance with applicable plumbing code.
- P. Install stainless steel piping in accordance with ASME A112.3.1 and applicable plumbing code.
- Q. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."
- R. Install aboveground ABS piping in accordance with ASTM D2661.
- S. Install aboveground PVC piping in accordance with ASTM D2665.
- T. Install underground **[ABS][and][PVC]** piping in accordance with ASTM D2321.
- U. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- V. Install underground, ductile-iron, force-main piping according to AWWA C600.
 - 1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
 - 2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
 - 3. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.

- W. Install underground, copper, force-main tubing in accordance with CDA's "Copper Tube Handbook."
 - 1. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.
 - X. Install force mains at elevations indicated.
 - Y. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waster gravity-flow piping.
 - a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 - b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 3. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - Z. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 - AA. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
 - BB. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
 - CC. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."
- 3.3 JOINT CONSTRUCTION
- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.
 - C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
 - D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.
 1. Cut threads full and clean using sharp dies.
 2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 - c. Do not use pipe sections that have cracked or open welds.
 - E. Join stainless steel pipe and fittings with gaskets in accordance with ASME A112.3.1.
 - F. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.
 - G. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
 - H. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
 - I. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.
 3. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendixes.
 - J. Joint Restraints and Sway Bracing:
 1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:
 - a. Provide axial restraint for pipe and fittings **[5 inches (125 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
 - b. Provide rigid sway bracing for pipe and fittings **[4 inches (100 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction 45 degrees and greater.
 - c. Provide rigid sway bracing for pipe and fittings **[5 inches (125 mm)]<Insert dimensions>** and larger, upstream and downstream of all changes in direction and branch openings.
- 3.4 INSTALLATION OF SPECIALTY PIPE FITTINGS
- A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in ODs.
 2. In Waste Drainage Piping: **[Unshielded][Shielded]**, nonpressure transition couplings.
 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
 4. In Underground Force Main Piping:

- a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
- b. NPS 2 (DN 50) and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric **[nipples][unions]**.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric **[flanges][flange kits][nipples]**.
4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF VALVES

- A. General valve installation requirements for general-duty valve installation are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install **[gate][full-port ball]** valve for piping **NPS 2 (DN 50)** and smaller.
3. Install **[gate]<Insert type>** valve for piping **NPS 2-1/2 (DN 65)** and larger.

- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

- D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. **[Use normally closed type unless otherwise indicated.]**
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for pipe hanger and support devices and installation specified in **[Section 220529 "Hangers and Supports for Plumbing Piping and Equipment"]****[Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment"]**.

1. Install **[carbon-steel]<Insert material>** pipe hangers for horizontal piping in noncorrosive environments.
2. Install **[stainless steel][fiberglass]** pipe hangers for horizontal piping in corrosive environments.
3. Install **[carbon-steel]<Insert material>** pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42 clamps.
6. Install individual, straight, horizontal piping runs:

- a. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Ft. (30 m) if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52 spring hangers.
- C. Install hangers for **[cast-iron][steel][stainless steel][and][copper]** soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for **[ABS][and][PVC]** piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping and tubing within **12 inches (300 mm)** of each fitting[, **valve,**] and coupling.
- F. Support vertical runs of **[cast-iron][steel][stainless steel][and][copper]** soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of **[ABS][and][PVC]** piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 5. Install horizontal backwater valves **[with cleanout cover flush with floor][in pit with pit cover flush with floor]<Insert description>**.
 6. Comply with requirements for **[backwater valves][cleanouts][and][drains]** specified in Section 221319 "Sanitary Waste Piping Specialties."
 7. Equipment: Connect waste piping as indicated.
 - a. Provide shutoff valve if indicated and union for each connection.
 - b. Use flanges instead of unions for connections **NPS 2-1/2 (DN 65)** and larger.
- D. Connect force-main piping to the following:
 1. Sanitary Sewer: To exterior force main.
 2. Sewage Pump: To sewage pump discharge.

- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. Make connections in accordance with the following unless otherwise indicated:
 - 1. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than **10 ft. head of water (30 kPa head of water)**.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.

- c. Inspect joints for leaks.
- 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of **1 inch wg (250 Pa)**.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
- 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
- 6. Prepare reports for tests and required corrective action.
- E. Test force-main piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 2. Cap and subject piping to static-water pressure of **50 psig (345 kPa)** above operating pressure, without exceeding pressure rating of piping system materials.
 - a. Isolate test source and allow to stand for four hours.
 - b. Leaks and loss in test pressure constitute defects that must be repaired.
 - 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 4. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed Plastic Piping: Protect **[ABS][PVC]** plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller are to be the following:

1. Service cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings[**and hubless, single-stack aerator fittings**]; **[CISPI][heavy-duty]** hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Stainless steel pipe and fittings, sealing rings, and gasketed joints.
5. Copper Type DWV tube, copper drainage fittings, and soldered joints.
6. **[Solid-wall][Cellular-core]** ABS pipe, ABS socket fittings, and solvent-cemented joints.
7. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
8. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 (DN 125) and larger are to be the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings [**and hubless, single-stack aerator fittings**]; **[CISPI][heavy-duty]** hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Stainless steel pipe and fittings, sealing rings, and gasketed joints.
5. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
6. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

D. Aboveground, vent piping NPS 4 (DN 100) is to be the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI][heavy-duty]** hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Stainless steel pipe and fittings gaskets, and gasketed joints.
5. Copper Type DWV tube, copper drainage fittings, and soldered joints.
- a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, **Type M (Type C)**; copper pressure fittings; and soldered joints.
6. **[Solid-wall][Cellular-core]** ABS pipe, ABS socket fittings, and solvent-cemented joints.
7. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
8. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 (DN 125) and larger is to be the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI][heavy-duty]** hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller are to be the following:

1. **[Extra-heavy][Service]** cast-iron soil piping; **[gaskets; and gasketed][caulking materials; and caulked]** joints.
2. Hubless, cast-iron soil pipe and fittings; **[CISPI][heavy-duty][cast-iron]** hubless-piping couplings; and coupled joints.
3. Stainless steel pipe and fittings, gaskets, and gasketed joints.
4. **[Solid-wall][Cellular-core]** ABS pipe, ABS socket fittings, and solvent-cemented joints.
5. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
6. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.

- G. Underground, soil and waste piping NPS 5 (DN 125) and larger are to be the following:
1. **[Extra-heavy][Service]**, cast-iron soil piping; **[gaskets; and gasketed][caulking materials; and caulked]** joints.
 2. Hubless, cast-iron soil pipe and fittings; **[CISPI][heavy-duty][cast-iron]** hubless-piping couplings; coupled joints.
 3. **[Solid-wall][Cellular-core]** PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: **[Unshielded][Shielded]**, nonpressure transition couplings.
- H. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 (DN 40 and DN 50) are to be the following:
1. Hard copper tube, **Type L (Type B)**; copper pressure fittings; and soldered joints.
 2. Galvanized-steel pipe, pressure fittings, and threaded joints.
- I. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 (DN 65 to DN 150) are to be the following:
1. Hard copper tube, **Type L (Type B)**; copper pressure fittings; and soldered joints.
 2. Galvanized-steel pipe, pressure fittings, and threaded joints.
 3. Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
- J. Underground sanitary-sewage force mains NPS 4 (DN 100) and smaller are to be the following:
1. **[Hard][Soft]** copper tube, **Type L (Type B)**; **[wrought-]**copper pressure fittings; and soldered joints.
 2. Ductile-iron, mechanical-joint piping and mechanical joints.
 3. Ductile-iron, push-on-joint piping and push-on joints.
 4. Ductile-iron, grooved-joint piping and grooved joints.
 5. Fitting-type transition coupling for piping smaller than **NPS 1-1/2 (DN 40)** and pressure transition coupling for **NPS 1-1/2 (DN 40)** and larger if dissimilar pipe materials.
- K. Underground sanitary-sewage force mains NPS 5 (DN 125) and larger are to be the following:
1. Hard copper tube, **Type L (Type B)**; **[wrought-]**copper pressure fittings; and soldered joints.
 2. Ductile-iron, mechanical-joint piping and mechanical joints.
 3. Ductile-iron, push-on-joint piping and push-on joints.
 4. Ductile-iron, grooved-joint piping and grooved joints.
 5. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION 22 13 16 00



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Task	Specification	Specification Description
22 13 16 00	21 05 00 00	Common Work Results for Fire Suppression
22 13 16 00	22 05 00 00	Common Work Results for Plumbing
22 13 16 00	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 16 00	22 11 16 00a	Storm Drainage Piping
22 13 16 00	23 05 00 00	Common Work Results for HVAC



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SECTION 22 13 19 00 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Air-admittance valves.
4. Miscellaneous sanitary drainage piping specialties.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashing assemblies.
2. Section 077200 "Roof Accessories" for preformed flashings.
3. Section 078413 "Penetration Firestopping" for through-penetration firestop assemblies.
4. Section 221323 "Sanitary Waste Interceptors" for metal and concrete interceptors outside the building, grease interceptors, grease-removal devices, oil interceptors, and solids interceptors.
5. Section 221423 "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.
6. Section 224300 "Healthcare Plumbing Fixtures" for plaster sink interceptors.
7. Section 334200 "Stormwater Conveyance" for storm drainage piping and piping specialties outside the building.

1.2 DEFINITIONS

- A. ABS:** Acrylonitrile butadiene styrene.
- B. PVC:** Polyvinyl chloride.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:**
1. Show fabrication and installation details for frost-resistant vent terminals.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.**

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:** For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 BACKWATER VALVES

- A. Horizontal, Cast-Iron Backwater Valves :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
- 3. Standard: ASME A112.14.1.
- 4. Size: Same as connected piping.
- 5. Body: Cast iron.
- 6. Cover: Cast iron with **[bolted][or][threaded]** access check valve.
- 7. End Connections: **[Hub and spigot][Hub and spigot or hubless][Hubless]**.
- 8. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang **[closed][open for airflow unless subject to backflow condition]**.
- 9. Extension: ASTM A74, Service Class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

- B. Drain-Outlet Backwater Valves :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**

- b. [Josam Company]
 - c. [WATTS; A Watts Water Technologies Company]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [WATTS; A Watts Water Technologies Company]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
 - 3. Size: Same as floor drain outlet.
 - 4. Body: Cast iron or bronze; made for vertical installation in bottom outlet of floor drain.
 - 5. Check Valve: Removable ball float.
 - 6. Inlet: Threaded.
 - 7. Outlet: Threaded or spigot.
- C. Horizontal, Plastic Backwater Valves :
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [NDS Inc]
 - d. [Oatey Co.]
 - e. [Plastic Oddities]
 - f. [Sioux Chief Manufacturing Company, Inc.]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [NDS Inc]
 - d. [Oatey Co.]
 - e. [Plastic Oddities]
 - f. [Sioux Chief Manufacturing Company, Inc.]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
 - 3. Size: Same as connected piping.
 - 4. Body: [ABS][PVC].
 - 5. Cover: Same material as body with threaded access to check valve.
 - 6. Check Valve: Removable swing check.
 - 7. End Connections: Socket type.

2.3 CLEANOUTS**A. Cast-Iron Exposed Cleanouts :**

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Tyler Pipe; a subsidiary of McWane Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
3. Standard: ASME A112.36.2M.
4. Size: Same as connected drainage piping
5. Body Material: **[Hub-and-spigot, cast-iron soil pipe T-branch][Hubless, cast-iron soil pipe test tee]** as required to match connected piping.
6. Closure: **[Countersunk][Countersunk or raised-head][Raised-head], [brass][cast-iron][plastic]** plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Stainless Steel Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[BLÜCHER; A Watts Water Technologies Company]**
 - b. **[Josam Company]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[BLÜCHER; A Watts Water Technologies Company]**
 - b. **[Josam Company]**
 - c. **<Insert manufacturer's name>**

3. Standard: ASME A112.3.1.
4. Size: Same as connected drainage piping.
5. Body Material: Stainless steel tee with side cleanout as required to match connected piping.
6. Closure: Stainless steel plug with seal.

C. Cast-Iron Exposed Floor Cleanouts :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Sioux Chief Manufacturing Company, Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[Sioux Chief Manufacturing Company, Inc.]**
 - e. **[WATTS; A Watts Water Technologies Company]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
3. Standard: ASME A112.36.2M for **[adjustable housing][cast-iron soil pipe with cast-iron ferrule][heavy-duty, adjustable housing][threaded, adjustable housing]** cleanout.
4. Size: Same as connected branch.
5. Type: **[Adjustable housing][Cast-iron soil pipe with cast-iron ferrule][Heavy-duty, adjustable housing][Threaded, adjustable housing]**.
6. Body or Ferrule: Cast iron.
7. Clamping Device: **[Not required][Required]**.
8. Outlet Connection: **[Inside calk][Spigot][Threaded]**.
9. Closure: **[Brass plug with straight threads and gasket][Brass plug with tapered threads][Cast-iron plug][Plastic plug]**.
10. Adjustable Housing Material: **[Cast iron][Plastic]<Insert material>** with **[threads][setscrews or other device]**.
11. Frame and Cover Material and Finish: **[Nickel-bronze, copper alloy][Painted cast iron][Polished bronze][Rough bronze][Stainless steel]<Insert material and finish>**.
12. Frame and Cover Shape: **[Round][Square]<Insert shape>**.
13. Top-Loading Classification: **[Extra Heavy][Heavy][Light][Medium]** Duty.
14. Riser: ASTM A74, **[Extra-Heavy][Service]** Class, cast-iron drainage pipe fitting and riser to cleanout.

D. Stainless Steel Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the**

following]:

- a. **[BLÜCHER; A Watts Water Technologies Company]**
 - b. **[Josam Company]**
 - c. **[Kusel Equipment Co]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[BLÜCHER; A Watts Water Technologies Company]**
 - b. **[Josam Company]**
 - c. **[Kusel Equipment Co]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
3. Standards: ASME A112.3.1[; **NSF listed**].
 4. Size: Same as connected branch.
 5. Housing: **[Type 304 stainless steel][Type 316 stainless steel]**.
 6. Closure: **[Stainless steel with seal][Plastic plug]**.
 7. Riser: ASTM A74, **[Extra-Heavy][Service]** Class, **[stainless steel][cast-iron]** drainage pipe fitting and riser to cleanout.
 8. Body or Ferrule: Stainless steel.
 9. Clamping Device: **[Not required][Required]**.
 10. Outlet Connection: **[Inside caulk][Spigot][Threaded][Butt-weld]**.
 11. Adjustable Housing Material: **[Cast iron][Plastic]<Insert material>** with **[threads][setscrews or other device]**.
 12. Frame and Cover Material and Finish: Stainless steel.
 13. Frame and Cover Shape: **[Round][Square]<Insert shape>**.
 14. Top-Loading Classification: **[Extra Heavy][Heavy][Light][Medium]** Duty.

E. Cast-Iron Wall Cleanouts :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[WATTS; A Watts Water Technologies Company]**

- e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
- 3. Standard: ASME A112.36.2M. Include wall access.
 - 4. Size: Same as connected drainage piping.
 - 5. Body: **[Hub-and-spigot, cast-iron soil pipe T-branch][Hubless, cast-iron soil pipe test tee]** as required to match connected piping.
 - 6. Closure Plug:
 - a. **[Brass][Cast iron]**.
 - b. **[Countersunk][or][raised]** head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as or not more than one size smaller than cleanout size.
 - 7. Wall Access, Cover Plate: Round, **[deep, chrome-plated bronze][flat, chrome-plated brass or stainless steel]** cover plate with screw.
 - 8. Wall Access, Frame and Cover: **[Round][Square]**, **[nickel-bronze, copper-alloy, or stainless steel]****<Insert material>** wall-installation frame and cover.

F. Plastic Floor Cleanouts :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Endura; a brand of IPEX]**
 - b. **[IPS Corporation]**
 - c. **[NDS Inc]**
 - d. **[Plastic Oddities]**
 - e. **[Sioux Chief Manufacturing Company, Inc.]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Endura; a brand of IPEX]**
 - b. **[IPS Corporation]**
 - c. **[NDS Inc]**
 - d. **[Plastic Oddities]**
 - e. **[Sioux Chief Manufacturing Company, Inc.]**
 - f. **[Zurn Industries, LLC]**
 - g. **<Insert manufacturer's name>**
- 3. Size: Same as connected branch.
- 4. Body: PVC.
- 5. Closure Plug: PVC.
- 6. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.4 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Ayrlett, LLC]**
 - b. **[Oatey Co.]**
 - c. **[ProVent Systems]**
 - d. **[Studor, Inc]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Ayrlett, LLC]**
 - b. **[Oatey Co.]**
 - c. **[ProVent Systems]**
 - d. **[Studor, Inc]**
 - e. **<Insert manufacturer's name>**
3. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
4. Housing: Plastic.
5. Operation: Mechanical sealing diaphragm.
6. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Oatey Co.]**
 - b. **[Sioux Chief Manufacturing Company, Inc.]**
 - c. **[Studor, Inc]**
 - d. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Oatey Co.]**
 - b. **[Sioux Chief Manufacturing Company, Inc.]**
 - c. **[Studor, Inc]**
 - d. **<Insert manufacturer's name>**
3. Standard: ASSE 1050 for vent stacks.
4. Housing: Plastic.
5. Operation: Mechanical sealing diaphragm.
6. Size: Same as connected stack vent or vent stack.

C. Wall Box for Air-Admittance Valves :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Oatey Co.]
- b. [Sioux Chief Manufacturing Company, Inc.]
- c. [Studor, Inc]
- d. <Insert manufacturer's name>

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Oatey Co.]
- b. [Sioux Chief Manufacturing Company, Inc.]
- c. [Studor, Inc]
- d. <Insert manufacturer's name>

- 3. Description: White plastic housing with white plastic grille, made for recessed installation. Include bottom pipe connection and space to contain one air-admittance valve.
- 4. Size: Approximately 6 inches wide by 6 inches high by 4 inches deep (150 mm wide by 150 mm high by 100 mm deep).

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains <Insert drawing designation, if any>:

- 1. Description: Shop or field fabricate from ASTM A74, Service Class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C564 rubber gaskets.
- 2. Size: Same as connected waste piping[with increaser fitting of size indicated].

B. Deep-Seal Traps <Insert drawing designation, if any>:

- 1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
- 2. Size: Same as connected waste piping.
 - a. **NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.**
 - b. **NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.**

C. Floor-Drain, Trap-Seal Primer Fittings <Insert drawing designation, if any>:

- 1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
- 2. Size: Same as floor drain outlet with **NPS 1/2 (DN 15)** side inlet.

D. Floor-Drain, Inline Trap Seal :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Green Drain, Inc.]

- b. [Jay R. Smith Mfg Co; a division of Morris Group International]
- c. [Josam Company]
- d. [MIFAB, Inc]
- e. [RectorSeal Plumbing; A CSW Industrials Company]
- f. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Green Drain, Inc.]
- b. [Jay R. Smith Mfg Co; a division of Morris Group International]
- c. [Josam Company]
- d. [MIFAB, Inc]
- e. [RectorSeal Plumbing; A CSW Industrials Company]
- f. <Insert manufacturer's name>

- 3. Description: Inline floor drain trap seal, forming a physical barrier to slow trap evaporation while not impeding flow from drain.
- 4. Material: Polymer.
- 5. Standard: Tested and certified in accordance with ASSE 1072.
- 6. Listing: [ICC-ES][or][IAPMO] listed.
- 7. Size: Same as floor drain outlet or strainer throat.

E. Air-Gap Fittings <Insert drawing designation, if any>:

- 1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
- 2. Body: Bronze or cast iron.
- 3. Inlet: Opening in top of body.
- 4. Outlet: Larger than inlet.
- 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

F. Sleeve Flashing Device <Insert drawing designation, if any>:

- 1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend [1 inch (25 mm)][2 inches (51 mm)]<Insert dimension> above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
- 2. Size: As required for close fit to riser or stack piping.

G. Stack Flashing Fittings <Insert drawing designation, if any>:

- 1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- 2. Size: Same as connected stack vent or vent stack.

H. Vent Caps <Insert drawing designation, if any>:

- 1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
- 2. Size: Same as connected stack vent or vent stack.

I. Frost-Resistant Vent Terminals <Insert drawing designation, if any>:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide **1-inch (25-mm)** enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

J. Expansion Joints **<Insert drawing designation, if any>**:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backwater valves in building drain piping.
1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to **NPS 4 (DN 100)**. Use **NPS 4 (DN 100)** for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of **50 feet (15 m)** for piping **NPS 4 (DN 100)** and smaller and **100 feet (30 m)** for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install fixture air-admittance valves on fixture drain piping.
- F. Install stack air-admittance valves at top of stack vent and vent stack piping.
- G. Install air-admittance-valve wall boxes recessed in wall.
- H. Assemble open drain fittings and install with top of hub [**1 inch (25 mm)**][**2 inches (51 mm)**]**<Insert dimension>** above floor.
- I. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into

sanitary drainage system.

- L. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain **1-inch (25-mm)** clearance between vent pipe and roof substrate.
- O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- P. Install frost-proof vent caps on each vent pipe passing through roof. Maintain **1-inch (25-mm)** clearance between vent pipe and roof substrate.
- Q. Install wood-blocking reinforcement for wall-mounting-type specialties.
- R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19 00



Task	Specification	Specification Description
22 13 19 00	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 19 00	23 41 33 00	High-Efficiency Particulate Air Filtration



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SECTION 22 13 19 13 - SANITARY DRAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Floor drains.
 - 2. Floor sinks.
 - 3. Trench drains.
 - 4. Concrete trench drain-forming system.

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene styrene.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene.
- D. PE: Polyethylene.
- E. PP: Polypropylene.
- F. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sanitary drains are to bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

- A. Floor Drain - Cast Iron :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

- a. [Commercial Enameling Company]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Josam Company]
 - d. [MIFAB, Inc]
 - e. [Prier Products, Inc.]
 - f. [Sioux Chief Manufacturing Company, Inc.]
 - g. [Wade; a subsidiary of McWane Inc.]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Whitehall Manufacturing; a division of Morris Group International]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Commercial Enameling Company]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. [Josam Company]
 - d. [MIFAB, Inc]
 - e. [Prier Products, Inc.]
 - f. [Sioux Chief Manufacturing Company, Inc.]
 - g. [Wade; a subsidiary of McWane Inc.]
 - h. [WATTS; A Watts Water Technologies Company]
 - i. [Whitehall Manufacturing; a division of Morris Group International]
 - j. [Zurn Industries, LLC]
 - k. <Insert manufacturer's name>
3. Source Limitations: Obtain cast-iron floor drains from single manufacturer.
4. Standard: ASME A112.6.3[with backwater valve].
5. Pattern: [Area][Floor][Funnel floor][Sanitary]<Insert pattern> drain.
6. Body Material: [Gray iron]<Insert material>.
7. Seepage Flange: [Not required][Required].
8. Anchor Flange: [Not required][Required].
9. Clamping Device: [Not required][Required].
10. Outlet: [Bottom][Side]<Insert type>.
11. Backwater Valve: [Drain-outlet type][Integral, ASME A112.14.1, swing-check type][Not required].
12. Coating on Interior and Exposed Exterior Surfaces: [Acid-resistant enamel][Not required]<Insert material>.
13. Sediment Bucket: [Not required]<Insert description>.
14. Top or Strainer Material: [Bronze][Gray iron][Nickel bronze][Stainless steel]<Insert material>.
15. Top of Body and Strainer Finish: [Nickel bronze][Polished bronze][Rough bronze][Stainless steel]<Insert finish>.
16. Top Shape: [Round][Square]<Insert shape>.
17. Dimensions of Top or Strainer: <Insert dimensions and describe body, sump, and grate>.
18. Top Loading Classification: [Extra Heavy Duty][Heavy Duty][Light Duty][Medium Duty].
19. Funnel: [Not required][Required]<Insert description and dimensions>.
20. Inlet Fitting: [Not required][Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection].
21. Trap Material: [Bronze][Cast iron][Copper][Not required]<Insert material>.
22. Trap Pattern: [Deep-seal P-trap][Standard P-trap][Not required]<Insert pattern>.
23. Trap Features: [Cleanout][Trap-seal primer valve drain connection][Cleanout and trap-seal primer valve drain connection][Not required]<Insert type>.

B. Floor Drain - Stainless Steel, ASME A112.3.1 :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Zurn Industries, LLC]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Zurn Industries, LLC]**
 - b. **<Insert manufacturer's name>**
3. Source Limitations: Obtain stainless steel floor drains, ASME A112.3.1, from single manufacturer.
4. Standard: ASME A112.3.1.
5. Outlet: **[Bottom][Side]<Insert type>**.
6. Top or Strainer Material: **[Stainless steel]<Insert material>**.
7. Top Shape: **[Round][Square]<Insert shape>**.
8. Dimensions of Top or Strainer: **<Insert dimensions and describe body, sump, and grate>**.
9. Seepage Flange: **[Not required][Required]**.
10. Anchor Flange: **[Not required][Required]**.
11. Clamping Device: **[Not required][Required]**.
12. Trap-Primer Connection: **[Not required][Required]**.
13. Trap Material: **[Cast iron][Stainless steel][Not required]<Insert material>**.
14. Trap Pattern: **[Deep-seal P-trap][Standard P-trap][Not required]<Insert pattern>**.

C. Floor Drain - Stainless Steel, ASME A112.6.3 :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ACO, Inc.]**
 - b. **[BLÜCHER; A Watts Water Technologies Company]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - d. **[Josam Company]**
 - e. **[Kusel Equipment Co]**
 - f. **[Scherping Systems, Inc.]**
 - g. **[Sioux Chief Manufacturing Company, Inc.]**
 - h. **[Wade; a subsidiary of McWane Inc.]**
 - i. **[WATTS; A Watts Water Technologies Company]**
 - j. **[Zurn Industries, LLC]**
 - k. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ACO, Inc.]**
 - b. **[BLÜCHER; A Watts Water Technologies Company]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**

- d. [Josam Company]
- e. [Kusel Equipment Co]
- f. [Scherping Systems, Inc.]
- g. [Sioux Chief Manufacturing Company, Inc.]
- h. [Wade; a subsidiary of McWane Inc.]
- i. [WATTS; A Watts Water Technologies Company]
- j. [Zurn Industries, LLC]
- k. <Insert manufacturer's name>

- 3. Source Limitations: Obtain stainless steel floor drains, ASME A112.6.3, from single manufacturer.
- 4. Standard: ASTM A112.6.3.
- 5. Outlet: [Bottom][Side]<Insert type>.
- 6. Top or Strainer Material: [Stainless steel]<Insert material>.
- 7. Top Shape: [Round][Square]<Insert shape>.
- 8. Dimensions of Top or Strainer: <Insert dimensions and describe body, sump, and grate>.
- 9. Seepage Flange: [Not required][Required].
- 10. Anchor Flange: [Not required][Required].
- 11. Clamping Device: [Not required][Required].
- 12. Trap-Primer Connection: [Not required][Required].
- 13. Trap Material: [Cast iron][Stainless steel][Not required]<Insert material>.
- 14. Trap Pattern: [Deep-seal P-trap][Standard P-trap][Not required]<Insert pattern>.

D. Floor Drain - Plastic :

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - d. [Josam Company]
 - e. [Oatey Co.]
 - f. [Plastic Oddities]
 - g. [Schluter Systems L.P.]
 - h. [Sioux Chief Manufacturing Company, Inc.]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - d. [Josam Company]
 - e. [Oatey Co.]
 - f. [Plastic Oddities]
 - g. [Schluter Systems L.P.]
 - h. [Sioux Chief Manufacturing Company, Inc.]
 - i. [Zurn Industries, LLC]
 - j. <Insert manufacturer's name>

3. Source Limitations: Obtain plastic floor drains from single manufacturer.
4. Standard: ASME A112.6.3.
5. Material: **[ABS][or][PVC]<Insert material>**.
6. Seepage Flange: **[Not required][Required]**.
7. Clamping Device: **[Not required][Required]**.
8. Outlet: **[Bottom][Side]<Insert type>**.
9. Sediment Bucket: **[Not required]<Insert description>**.
10. Top or Strainer Material: **[Bronze][Plastic][Stainless steel]<Insert other>**.
11. Top of Body and Strainer Finish: **[Nickel bronze][Polished bronze][Rough bronze][Stainless steel]<Insert other>**.
12. Top Shape: **[Round][Square]<Insert shape>**.
13. Dimensions of Top or Strainer: **<Insert dimensions and describe body, sump, and grate if required>**.
14. Trap Material: **[Cast iron][Plastic drainage piping][Not required]<Insert material>**.
15. Trap Pattern: **[Standard P-trap][Not required]<Insert pattern>**.

2.3 FLOOR SINKS

A. Floor Sink - Cast Iron :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Commercial Enameling Company]**
 - b. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - c. **[Wade; a subsidiary of McWane Inc.]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Commercial Enameling Company]**
 - b. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - c. **[Wade; a subsidiary of McWane Inc.]**
 - d. **[WATTS; A Watts Water Technologies Company]**
 - e. **[Zurn Industries, LLC]**
 - f. **<Insert manufacturer's name>**
3. Source Limitations: Obtain cast-iron floor sinks from single manufacturer.
4. Standard: ASME A112.6.7.
5. Pattern: **[Floor][Funnel floor]<Insert pattern>** drain.
6. Body Material: Cast iron.
7. Anchor Flange: **[Not required][Required][, with seepage holes]**.
8. Clamping Device: **[Not required][Required]**.
9. Outlet: Bottom, **[no-hub]<Insert type>** connection.
10. Coating on Interior Surfaces: **[Not required][Acid-resistant enamel]<Insert coating>**.
11. Sediment Bucket: **[Not required]<Insert description>**.
12. Internal Strainer: **[Not required][Dome][Flat]**.
13. Internal Strainer Material: **[Aluminum]<Insert material>**.
14. Top Grate Material: **[Cast iron]<Insert material>**, loose[, hinged].



15. Top of Body and Grate Finish: **[Nickel bronze][Acid-resistant enamel]<Insert finish>**.
16. Top Shape: **[Round][Square]<Insert shape>**.
17. Dimensions of Top Grate: **<Insert dimensions and describe grate pattern>**.
18. Top Loading Classification: **[No traffic]<Insert traffic loading>**.
19. Funnel: **[Not required][Required]. <Insert material, shape and dimensions>**.
20. **<Insert additional options here>**.

B. Floor Sink - Stainless Steel :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Wade; a subsidiary of McWane Inc.]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Wade; a subsidiary of McWane Inc.]**
 - c. **[WATTS; A Watts Water Technologies Company]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
3. Source Limitations: Obtain stainless steel floor sinks from single manufacturer.
4. Standard: ASME A112.6.7.
5. Pattern: **[Floor][Funnel floor]<Insert pattern>** drain.
6. Body Material: Stainless steel.
7. Anchor Flange: **[Not required][Required][, with seepage holes]**.
8. Clamping Device: **[Not required][Required]**.
9. Outlet: Bottom, **[no-hub]<Insert type>** connection.
10. Sediment Bucket: **[Not required]<Insert description>**.
11. Internal Strainer: **[Not required][Dome][Flat]**.
12. Internal Strainer Material: **[Stainless steel]<Insert material>**.
13. Top Grate Material: **[Stainless steel]<Insert material>[, loose][, hinged]**.
14. Top of Body and Grate Finish: **[Satin nickel][Stainless steel]<Insert finish>**.
15. Top Shape: **[Round][Square]<Insert shape>**.
16. Dimensions of Top Grate: **<Insert dimensions and describe grate pattern>**.
17. Top Loading Classification: **[No traffic]<Insert traffic loading>**.
18. Funnel: **[Not required][Required]. <Insert material, shape and dimensions>**.
19. **<Insert additional options here>**.

C. Floor Sink - Plastic :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [Oatey Co.]
 - d. [Plastic Oddities]
 - e. [Sioux Chief Manufacturing Company, Inc.]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Endura; a brand of IPEX]
 - b. [IPS Corporation]
 - c. [Oatey Co.]
 - d. [Plastic Oddities]
 - e. [Sioux Chief Manufacturing Company, Inc.]
 - f. <Insert manufacturer's name>
3. Source Limitations: Obtain plastic floor sinks from single manufacturer.
4. Standard: ASME A112.6.7.
5. Pattern: [Floor][Funnel floor]<Insert pattern> drain.
6. Body Material: PVC.
7. Outlet: Bottom, PVC primer and solvent cement connection.
8. Sediment Bucket: [Not required]<Insert description>.
9. Internal Strainer: [Not required][Dome][Flat].
10. Internal Strainer Material: [PVC]<Insert material>.
11. Top Grate Material: [PVC]<Insert material>.
12. Top Shape: [Round][Square]<Insert shape>.
13. Dimensions of Top Grate: <Insert dimensions and describe grate pattern>.
14. Top Loading Classification: [No traffic]<Insert traffic loading>.
15. Funnel: [Not required][Required]. <Insert material, shape and dimensions>.
16. <Insert additional options here>.

2.4 TRENCH DRAINS

A. Trench Drain, Individual - Cast Iron or Ductile Iron :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Sioux Chief Manufacturing Company, Inc.]
 - e. [Wade; a subsidiary of McWane Inc.]
 - f. [Zurn Industries, LLC]
 - g. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]

- b. **[Josam Company]**
- c. **[MIFAB, Inc]**
- d. **[Sioux Chief Manufacturing Company, Inc.]**
- e. **[Wade; a subsidiary of McWane Inc.]**
- f. **[Zurn Industries, LLC]**
- g. **<Insert manufacturer's name>**

- 3. Source Limitations: Obtain trench drains from single manufacturer.
- 4. Standard: ASME A112.6.3 for trench drains.
- 5. Material: Cast iron or ductile iron body.
- 6. Flange: **[Anchor][Seepage][Not required]**.
- 7. Clamping Device: **[Not required][Required]**.
- 8. Outlet: **[Bottom][End][Side]<Insert location>**.
- 9. Grate Material: **[Ductile iron][Ductile iron or gray iron][Gray iron][Stainless steel]<Insert material>**.
- 10. Grate Finish: **[Painted][Not required]<Insert finish>**.
- 11. Dimensions of Frame and Grate: **<Insert dimensions and describe body, sump, and grate if required>**.
- 12. Top Loading Classification: **[Extra Heavy Duty][Heavy Duty][Light Duty][Medium Duty]**.
- 13. Trap Material: **[Cast iron][Stainless steel][Not required]<Insert material>**.
- 14. Trap Pattern: **[Standard P-trap][Not required]<Insert pattern>**.

B. Trench Drain, Individual - Stainless Steel :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[WATTS; A Watts Water Technologies Company]**
 - b. **[Whitehall Manufacturing; a division of Morris Group International]**
 - c. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[WATTS; A Watts Water Technologies Company]**
 - b. **[Whitehall Manufacturing; a division of Morris Group International]**
 - c. **<Insert manufacturer's name>**
- 3. Source Limitations: Obtain stainless steel trench drain from single manufacturer.
- 4. Description: Stainless steel trench consisting of sloped trench body, grates, and appurtenances; designed so grates fit into trench body recesses without rocking or rattling.
- 5. Standard: ASME A112.6.3.
- 6. Dimensions: **<Insert dimensions>** wide by **<Insert dimensions long>**.
- 7. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channels.
 - a. Material: Stainless steel.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to body channel][Not required]**.
- 8. Covers: Solid stainless steel of width and thickness that fit recesses in channel, and of length indicated.

9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

C. Trench Drain, Modular Channel System - Stainless Steel :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ACO, Inc.]**
 - b. **[BLÜCHER; A Watts Water Technologies Company]**
 - c. **[Eric'sons]**
 - d. **[MultiDrain Systems, Inc.]**
 - e. **[Vodaland]**
 - f. **[Whitehall Manufacturing; a division of Morris Group International]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ACO, Inc.]**
 - b. **[BLÜCHER; A Watts Water Technologies Company]**
 - c. **[Eric'sons]**
 - d. **[MultiDrain Systems, Inc.]**
 - e. **[Vodaland]**
 - f. **[Whitehall Manufacturing; a division of Morris Group International]**
 - g. **[Zurn Industries, LLC]**
 - h. **<Insert manufacturer's name>**
3. Source Limitations: Obtain modular stainless steel channel systems, from single manufacturer.
4. Standard: ASME A112.6.8.
5. Description: Modular system of stainless steel channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
6. Channel Sections: Interlocking joint, stainless steel with level invert.
 - a. Dimensions: **[6 inches (152 mm)][12 inches (305 mm)]** wide. Include number of units required to form total lengths indicated.
7. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channels.
 - a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
8. Covers: Solid **[ductile or gray iron][stainless steel]<Insert material>**, of width and thickness that fit recesses in channels, and of lengths indicated.
9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
10. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

D. Trench Drain, Modular Channel System - Polymer Concrete, Narrow, Sloped Invert :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[ABT, Inc.]**
- b. **[ACO, Inc.]**
- c. **[Eric'sons]**
- d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
- e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- f. **[MultiDrain Systems, Inc.]**
- g. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[ABT, Inc.]**
- b. **[ACO, Inc.]**
- c. **[Eric'sons]**
- d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
- e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
- f. **[MultiDrain Systems, Inc.]**
- g. **<Insert manufacturer's name>**

3. Source Limitations: Obtain narrow, sloped-invert, polymer-concrete channel drainage systems from single manufacturer.
4. Standard: ASME A112.6.8.
5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
6. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps.

- a. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated.
- b. Include extension sections necessary for required depth.
- c. Dimensions: **[4-inch (102-mm)]<Insert dimension>** inside width. Include number of units required to form total lengths indicated.
- d. Frame: **[Gray-iron, cast iron, or galvanized steel for grates][Not required]<Insert material>**.

7. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.

- a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
- b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.

8. Covers: Solid **[ductile or gray iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
10. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

- E. Trench Drain, Modular Channel System - Polymer Concrete, Narrow, Level Invert :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - d. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - e. **[Josam Company]**
 - f. **[MultiDrain Systems, Inc.]**
 - g. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - d. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - e. **[Josam Company]**
 - f. **[MultiDrain Systems, Inc.]**
 - g. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain narrow, level-insert, polymer-concrete channel drainage systems from single manufacturer.
 4. Standard: ASME A112.6.8.
 5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 6. Channel Sections: Narrow, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with level invert and with **NPS 4 (DN 100)** outlets in number and locations indicated.
 - b. Dimensions: **[5-inch (127-mm)]<Insert dimension>** inside width and **[9-3/4 inches (248 mm)]<Insert dimension>** inside depth. Include number of units required to form total lengths indicated.
 - c. Frame: **[Gray-iron or galvanized steel for grates][Not required]<Insert material>**.
 7. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Cast iron or gray iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
 8. Covers: Solid **[ductile, cast, or gray iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 10. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- F. Trench Drain, Modular Channel System - Polymer Concrete, Wide, Level Invert :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[Josam Company]**
 - g. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. **[ABT, Inc.]**
 - b. **[ACO, Inc.]**
 - c. **[Eric'sons]**
 - d. **[Hubbell Utility Solutions; Hubbell Incorporated]**
 - e. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - f. **[Josam Company]**
 - g. **<Insert manufacturer's name>**
3. Source Limitations: Obtain wide, level-insert, polymer-concrete channel drainage systems from single manufacturer.
4. Standard: ASME A112.6.8.
5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
6. Channel Sections: Wide, interlocking-joint, precast, polymer-concrete modular units with end caps.
- a. Include flat or rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - b. Dimensions: **[8-inch (203-mm)]<Insert dimension>** inside width and **[13-3/4 inches (350 mm)]<Insert dimension>** inside depth. Include number of units required to form total lengths indicated.
 - c. Frame: **[Galvanized steel, gray iron, or cast iron for grates][Not required]<Insert material>**.
7. Grates: Manufacturer's designation "**[Heavy][Medium]** Duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
- a. Material: **[Ductile iron][Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
8. Covers: Solid **[ductile or gray iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
10. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

G. Trench Drain, Modular Channel System - FRP :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[ACO, Inc.]**
 - b. **[Aquaduct, Inc.]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ACO, Inc.]**
 - b. **[Aquaduct, Inc.]**
 - c. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - d. **[Zurn Industries, LLC]**
 - e. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain FRP channel drainage systems from single manufacturer.
 4. Standard: ASME A112.6.8.
 5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 6. Channel Sections: Interlocking-joint, sloped-invert, FRP modular units, with end caps. Include flat, rounded, or inclined inside bottom, with outlets in number, sizes, and locations indicated.
 - a. Dimensions: **[4 inches (102 mm)][4 or 6 inches (102 or 152 mm)][6 inches (152 mm)][6 or 8 inches (152 or 203 mm)][8 inches (203 mm)]** wide. Include number of units required to form total lengths indicated.
 - b. Frame: **[Galvanized steel][Stainless steel][Manufacturer's standard metal]<Insert material>** for grates.
 7. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: **[Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
 - b. Locking Mechanism: **[Manufacturer's standard device for securing grates to channel sections][Not required]**.
 8. Covers: Solid **[ductile or gray iron]<Insert material>**, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 9. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 10. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- H. Trench Drain, Modular Channel System - HDPE or PE :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Sioux Chief Manufacturing Company, Inc.]**
 - c. **[Tuf-Tite Corporation]**
 - d. **[Zurn Industries, LLC]**

- e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Sioux Chief Manufacturing Company, Inc.]
 - c. [Tuf-Tite Corporation]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
3. Source Limitations: Obtain HDPE or PE channel drainage systems from single manufacturer.
4. Standard: ASME A112.6.8.
5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
6. Channel Sections: Interlocking-joint, HDPE or PE modular units, with end caps. Include flat, rounded, or inclined bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - a. Dimensions: **4 inches (102 mm)** wide. Include number of units required to form total lengths indicated.
7. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: [Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>.
 - b. Color: <Insert color or delete subparagraph>.
8. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- I. Trench Drain, Modular Channel System - PP :
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Infinity Plastics, Inc.]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Infinity Plastics, Inc.]
 - b. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - c. <Insert manufacturer's name>
 3. Source Limitations: Obtain PP channel drainage systems from single manufacturer.
 4. Standard: ASME A112.6.8.
 5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 6. Channel Sections: Interlocking-joint, PP modular units, with end caps. Include flat, rounded, or

inclined bottom, with level invert and with outlets in number, sizes, and locations indicated.

- a. Dimensions: **4 inches (102 mm)** wide. Include number of units required to form total lengths indicated.
 7. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: **[Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
 - b. Color: **<Insert color or delete subparagraph>**.
 8. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- J. Trench Drain, Modular Channel System - PVC :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[MultiDrain Systems, Inc.]**
 - b. **[NDS Inc]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[MultiDrain Systems, Inc.]**
 - b. **[NDS Inc]**
 - c. **<Insert manufacturer's name>**
 3. Source Limitations: Obtain PVC channel drainage systems from single manufacturer.
 4. Standard: ASME A112.6.8.
 5. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 6. Channel Sections: Interlocking-joint, PVC modular units, with end caps. Include flat, rounded, or inclined bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - a. Dimensions: **4 inches (102 mm)** wide. Include number of units required to form total lengths indicated.
 7. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
 - a. Material: **[Fiberglass][Galvanized steel][Gray iron][Stainless steel]<Insert material>**.
 - b. Color: **<Insert color or delete subparagraph>**.
 8. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 9. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.5 CONCRETE TRENCH DRAIN-FORMING SYSTEM

- A. Concrete Trench Drain-Forming System: .



1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ABT, Inc.]
 - b. [ACO, Inc.]
 - c. [Eric'sons]
 - d. [MultiDrain Systems, Inc.]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ABT, Inc.]
 - b. [ACO, Inc.]
 - c. [Eric'sons]
 - d. [MultiDrain Systems, Inc.]
 - e. <Insert manufacturer's name>
3. Source Limitations: Obtain concrete trench drain-forming system from single manufacturer.
4. Description: Radius trench-drain-forming system, including a removable form that is customizable for width, depth, length, shape, slope, frame material, and grate material.
5. Form Bottom: [Smooth radius][Vee][Flat]<Insert option>.
6. Form Use: [Single use][or][reusable].
7. Form Covers: Plywood or metal to keep concrete out of trench form during installation.
8. Width: [8-inch (203-mm)][10-inch (254-mm)][12-inch (305-mm)][18-inch (457-mm)][24-inch (610-mm)]<Insert width> inside dimension.
9. Depth: [See Drawings]<Insert dimension>.
10. Length: [See Drawings]<Insert dimension>.
11. Bottom Shape: [Smooth radius][Vee]<Insert shape>.
12. Slope: [Level - no slope][0.5 percent][0.6 percent][1.0 percent]<Insert slope>.
13. Frame/Grate Seat:
 - a. Load Bearing, <Insert loading requirement>.
 - b. Material: [Powder-coated steel][Galvanized steel][Iron][Aluminum][Plastic][FRP][Stainless steel]<Insert material>.
14. Concrete Anchors: [18 inches (457 mm) o.c.]<Insert spacing>.
15. Grate:
 - a. Manufacturer's Load Bearing Designation: "[Heavy][Medium] Duty".
 - b. Material: [Ductile iron][FRP][Galvanized steel][Cast iron][Stainless steel]<Insert material>.
 - c. Grate Type: [ADA][Heel-proof][slotted][perforated][bar]<Insert grate type>.

PART 3 - EXECUTION

3.1 INSTALLATION OF SANITARY DRAINS

- A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
 3. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than **1/4-inch (6.35-mm)** total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than **1-inch (25-mm)** total depression.
 4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
 - a. Maintain integrity of waterproof membranes where penetrated.
 5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- B. Install trench drains at low points of surface areas to be drained.
1. Set grates of drains flush with finished surface, unless otherwise indicated.
- C. Comply with ASME A112.3.1 for installation of stainless steel channel drainage systems.
1. Install on support devices, so that top will be flush with adjacent surface.
- D. Install FRP channel drainage system components on support devices, so that top will be flush with adjacent surface.
- E. Install plastic channel drainage system components on support devices, so that top will be flush with adjacent surface.
- F. Install open drain fittings with top of hub [**1 inch (25 mm)**][**2 inches (51 mm)**]**<Insert dimension>** above floor.

3.2 PIPING CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.
- C. Comply with requirements in Section 221323 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.
- D. Install piping adjacent to equipment to allow service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."



3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19 13



Task	Specification	Specification Description
22 13 19 13	22 13 19 00	Sanitary Waste Piping Specialties
22 13 19 13	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 19 13	23 41 33 00	High-Efficiency Particulate Air Filtration
22 13 19 26	22 13 19 00	Sanitary Waste Piping Specialties
22 13 19 26	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 19 26	23 41 33 00	High-Efficiency Particulate Air Filtration
22 13 19 33	22 05 23 00	General-Duty Valves for Plumbing Piping
22 13 19 33	22 13 19 00	Sanitary Waste Piping Specialties
22 13 19 33	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 19 33	23 05 23 00	General-Duty Valves for HVAC Piping
22 13 19 33	23 41 33 00	High-Efficiency Particulate Air Filtration
22 13 19 36	22 13 19 00	Sanitary Waste Piping Specialties
22 13 19 36	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 19 36	23 41 33 00	High-Efficiency Particulate Air Filtration



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SECTION 22 13 23 00 - SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interceptors, grease.
2. Grease-removal devices.
3. Interceptors, oil.
4. Interceptors, sand.
5. Interceptors, sand and oil.
6. Interceptors, solids.
7. Precast-concrete manhole risers.
8. Manhole risers, frames, and covers.
9. Sampling ports.

1.2 DEFINITIONS

- A. FOGs: Fats, oils, greases.
- B. FRP: Fiberglass-reinforced plastic.
- C. PP: Polypropylene.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sanitary waste interceptor.
1. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size and location of each pipe connection, furnished specialties, and accessories.
 2. Include diagrams of power wiring.
- B. Shop Drawings: For each type and size of precast-concrete sanitary waste interceptor.
1. Include materials of construction, dimensions, rated capacities, retention capacities, location and size of each pipe connection, furnished specialties, and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Piping connections. Include size, location, and elevation of each.
 2. Interface with underground structures and utility services.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sanitary waste interceptors to include in emergency, operation, and maintenance manuals.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services in accordance with requirements indicated:
 - 1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[seven]<Insert number>** days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of sewer services without **[Architect's][Construction Manager's][Owner's]** written permission.

PART 2 - PRODUCTS

2.1 INTERCEPTORS, GREASE

- A. Interceptors, Grease - Precast Concrete :
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Concrete Products Co.]**
 - b. **[Copeland Precast, Inc.]**
 - c. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - d. **[Wieser Concrete]**
 - e. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Concrete Products Co.]**
 - b. **[Copeland Precast, Inc.]**
 - c. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - d. **[Wieser Concrete]**
 - e. **<Insert manufacturer's name>**
 - 3. Standard:
 - a. ASTM C913.
 - b. **[Specific requirements of the Authority Having Jurisdiction].**
 - 4. Description: Factory-fabricated grease interceptor for intercepting and retaining FOG from food**[-preparation][or][-processing]** wastewater.
 - 5. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping

- or openings to retain grease and to permit wastewater flow.
6. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
7. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.
 - c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
8. Resilient Pipe Connectors: **ASTM C923 (ASTM C923M)**, cast or fitted into interceptor walls, for each pipe connection.
9. Steps: **[Individual FRP steps or FRP ladder][Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP][ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP]<Insert material>**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at **12- to 16-inch (300- to 400-mm)** intervals. Omit steps if total depth from floor of interceptor to finished grade is less than **[60 inches (1500 mm)]<Insert dimension>**.
10. Grade Rings: Reinforced-concrete rings, **6- to 9-inch (150- to 225-mm)** total thickness, to match diameter of manhole frame and cover.
11. Manhole Frames and Covers: Ferrous; **24-inch (610-mm)** ID by **7- to 9-inch (175- to 225-mm)** riser with **4-inch- (100-mm-)** minimum-width flange and **26-inch- (660-mm-)** diameter cover.
 - a. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 - b. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 - c. Include indented top design with lettering cast into cover, using wording equivalent to **"[INTERCEPTOR][GREASE INTERCEPTOR][SANITARY SEWER]" <Insert lettering>**.
12. Capacities and Characteristics:
 - a. Length by Width by Depth: **<Insert inches (mm)>**.
 - b. Number of Compartments: **[One][Two]<Insert number>**.
 - c. Flow Rate: **<Insert gpm (L/s)>**.
 - d. Retention Capacity: **<Insert lb (kg)>**.
 - e. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - f. Trapped Outlet: Integral.
 - g. Cleanout: Integral **[or field installed on outlet]**.
 - h. Vent Pipe Size: **<Insert NPS (DN)>**.
 - i. Mounting: **[Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>**.
 - j. Flow-Control Fitting: Required.
 - k. Operation: **[Manual cleaning][Semiautomatic, manual drawoff]<Insert operation>**.

B. Interceptors, Grease - Steel :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**

- c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]
 - f. [Wade; a subsidiary of McWane Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]
 - f. [Wade; a subsidiary of McWane Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
3. Standard:
- a. PDI G101.
 - b. [ASME A112.14.3].
4. PDI Seal: Required.
5. Description: Factory-fabricated grease interceptor for intercepting and retaining FOG from food[-preparation][or][-processing] wastewater.
6. Body Material: Steel.
7. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
8. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
9. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
10. Body Extension: <Insert inches (mm)> height.
11. Capacities and Characteristics:
- a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Number of Compartments: [One][Two]<Insert number>.
 - c. Flow Rate: <Insert gpm (L/s)>.
 - d. Retention Capacity: <Insert lb (kg)>.
 - e. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
- 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
- f. Trapped Outlet: Integral.
 - g. Cleanout: Integral[or field installed on outlet].
 - h. Vent Pipe Size: <Insert NPS (DN)>.
 - i. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.
 - j. Flow-Control Fitting: Required.
 - k. Operation: [Manual cleaning][Semiautomatic, manual drawoff]<Insert operation>.

C. Interceptors, Grease - Plastic :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ashland PolyTrap]
 - b. [Bio-Microbics, Inc.]
 - c. [Canplas Industries Ltd.]
 - d. [MIFAB, Inc]
 - e. [Rockford Separators]
 - f. [Schier Products Company]
 - g. [Town & Country Plastics, Inc]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ashland PolyTrap]
 - b. [Bio-Microbics, Inc.]
 - c. [Canplas Industries Ltd.]
 - d. [MIFAB, Inc]
 - e. [Rockford Separators]
 - f. [Schier Products Company]
 - g. [Town & Country Plastics, Inc]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>

3. Standard:
 - a. PDI G101.
 - b. [ASME A112.14.3].

4. PDI Seal: Required.
5. Description: Factory-fabricated grease interceptor for intercepting and retaining FOG from food[-preparation][or][-processing] wastewater.
6. Body Material: Plastic.
7. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
8. Body Extension: <Insert inches (mm)> height.
9. Capacities and Characteristics:
 - a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Number of Compartments: [One][Two]<Insert number>.
 - c. Flow Rate: <Insert gpm (L/s)>.
 - d. Retention Capacity: <Insert lb (kg)>.
 - e. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - f. Trapped Outlet: Integral.
 - g. Cleanout: Integral[or field installed on outlet].
 - h. Vent Pipe Size: <Insert NPS (DN)>.
 - i. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.

- j. Flow-Control Fitting: Required.
- k. Operation: **[Manual cleaning][Semiautomatic, manual drawoff]<Insert operation>**.

2.2 GREASE-REMOVAL DEVICES

A. Grease-Removal Devices :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[G K & L, Inc]**
 - b. **[Grease Guardian]**
 - c. **[Highland Tank & Manufacturing Company, Inc.]**
 - d. **[International Grease Recovery Device]**
 - e. **[Josam Company]**
 - f. **[MIFAB, Inc]**
 - g. **[Thermaco, Inc]**
 - h. **[Wade; a subsidiary of McWane Inc.]**
 - i. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[G K & L, Inc]**
 - b. **[Grease Guardian]**
 - c. **[Highland Tank & Manufacturing Company, Inc.]**
 - d. **[International Grease Recovery Device]**
 - e. **[Josam Company]**
 - f. **[MIFAB, Inc]**
 - g. **[Thermaco, Inc]**
 - h. **[Wade; a subsidiary of McWane Inc.]**
 - i. **<Insert manufacturer's name>**
3. Standard:
 - a. PDI G101.
 - b. **[ASME A112.14.3].**
 - c. **[ASME A112.14.4].**
4. PDI Seal: Required.
5. Description: Factory-fabricated grease-removal device for automatic intercepting and removal of FOG from food**[-preparation][or][-processing]<Insert application>** wastewater.
6. Body Material: **[Stainless steel][Steel]<Insert material>**.
7. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
8. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacture's acid-resistant coating.
9. Interior Separation Device: **[Baffles][Screens]<Insert device>**.
10. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
11. Capacities and Characteristics:
 - a. Heater: Required.
 - b. Length by Width by Depth: **<Insert inches (mm)>**.

- c. Flow Rate: **<Insert gpm (L/s)>**.
- d. Basket Material: **[Stainless steel]<Insert material>**.
- e. Inlet and Outlet Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
- f. Cleanout: Integral **[or field installed on outlet]**.
- g. Vent Pipe Size: **<Insert NPS (DN)>**.
- h. Mounting: **[Above floor]<Insert mounting>**.
- i. Flow-Control Fitting: Required.
- j. Operation: **[Automatic recovery]<Insert operation>**.
- k. Electrical Characteristics:
 - 1) Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2) Power Requirement: **[120 V ac]<Insert power>**.
 - 3) Full-Load Amperes: **<Insert number> A.**
 - 4) Minimum Circuit Ampacity: **<Insert number> A.**
 - 5) Maximum Overcurrent Protection: **<Insert number> A.**
- l. Waste Grease Receptacle: **[Furnished by Owner]<Insert description>**.

2.3 INTERCEPTORS, OIL

A. Interceptors, Oil - Precast Concrete :

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Advance Concrete Products Co.]**
 - b. **[Copeland Precast, Inc.]**
 - c. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - d. **[Wieser Concrete]**
 - e. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Advance Concrete Products Co.]**
 - b. **[Copeland Precast, Inc.]**
 - c. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - d. **[Wieser Concrete]**
 - e. **<Insert manufacturer's name>**
- 3. Standard:
 - a. ASTM C913.
 - b. **[Specific requirements of the Authority Having Jurisdiction]**.
- 4. Description: Factory-fabricated oil interceptor with removable sediment bucket or strainer, baffles,

- vents, and flow-control fitting on inlet.
5. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain oil and to permit wastewater flow.
6. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
7. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.
 - c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
8. Resilient Pipe Connectors: **ASTM C923 (ASTM C923M)**, cast or fitted into interceptor walls, for each pipe connection.
9. Steps: **[Individual FRP steps or FRP ladder][Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP][ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP]<Insert material>**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at **12- to 16-inch (300- to 400-mm)** intervals. Omit steps if total depth from floor of interceptor to finished grade is less than **[60 inches (1500 mm)]<Insert dimension>**.
10. Grade Rings: Reinforced-concrete rings, **6- to 9-inch (150- to 225-mm)** total thickness, to match diameter of manhole frame and cover.
11. Manhole Frames and Covers: Ferrous; **24-inch (610-mm)** ID by **7- to 9-inch (175- to 225-mm)** riser, with **4-inch- (100-mm-)** minimum-width flange and **26-inch- (660-mm-)** diameter cover.
 - a. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 - b. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 - c. Include indented top design with lettering cast into cover, using wording equivalent to **"[INTERCEPTOR][OIL INTERCEPTOR][SANITARY SEWER]" <Insert lettering>**.
12. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
13. Capacities and Characteristics:
 - a. Length by Width by Depth: **<Insert inches (mm)>**.
 - b. Flow Rate: **<Insert gpm (L/s)>**.
 - c. Capacity: **<Insert gal. (L)>**.
 - d. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - e. Waste-Oil-Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - f. Trapped Outlet: Integral.
 - g. Cleanout: Integral **[or field installed on outlet]**.
 - h. Vent Pipe Size: **<Insert NPS (DN)>**.
 - i. Mounting: **[Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>**.
 - j. Flow-Control Fitting: Required.

B. Interceptors, Oil - Steel :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]
 - f. [Wade; a subsidiary of McWane Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]
 - f. [Wade; a subsidiary of McWane Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
3. Description: Factory-fabricated oil interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
4. Body Material: Steel.
5. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
6. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
7. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
8. Extension: Cast-iron or steel shroud, full size of interceptor, extending from top of interceptor to grade.
9. Cover: Cast iron or steel, with steel reinforcement to provide ASTM C890 [A-03, walkway]<Insert loading type> load.
10. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
11. Capacities and Characteristics:
 - a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Flow Rate: <Insert gpm (L/s)>.
 - c. Capacity: <Insert gal. (L)>.
 - d. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - e. Waste-Oil-Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - f. Trapped Outlet Required: Integral.

- g. Cleanout: Integral[**or field installed on outlet**].
- h. Vent Pipe Size: **<Insert NPS (DN)>**.
- i. Mounting: [**Above floor**][**Recessed in acid-resistant, coated steel frame and cradle**][**Recessed, flush with floor**]**<Insert mounting>**.
- j. Flow-Control Fitting: Required.

C. Interceptors, Oil - Plastic :

1. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][**provide products by one of the following**][**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. [**MIFAB, Inc**]
 - b. [**Striem**]
 - c. [**Town & Country Plastics, Inc**]
 - d. [**Xerxes by Shawcor Ltd.**]
 - e. [**Zurn Industries, LLC**]
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. [**MIFAB, Inc**]
 - b. [**Striem**]
 - c. [**Town & Country Plastics, Inc**]
 - d. [**Xerxes by Shawcor Ltd.**]
 - e. [**Zurn Industries, LLC**]
 - f. **<Insert manufacturer's name>**
3. Description: Factory-fabricated oil interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
4. Body Material: Plastic.
5. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
6. Extension: Plastic shroud, full size of interceptor, extending from top of interceptor to grade.
7. Cover: Plastic[**with steel reinforcement to provide ASTM C890**][**A-03, walkway**]**<Insert loading type>** load.
8. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
9. Capacities and Characteristics:
 - a. Length by Width by Depth: **<Insert inches (mm)>**.
 - b. Flow Rate: **<Insert gpm (L/s)>**.
 - c. Capacity: **<Insert gal. (L)>**.
 - d. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - e. Waste-Oil-Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - f. Trapped Outlet: Integral.

- g. Cleanout: Integral[or field installed on outlet].
- h. Vent Pipe Size: <Insert NPS (DN)>.
- i. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.
- j. Flow-Control Fitting: Required.

2.4 INTERCEPTORS, SAND

A. Interceptors, Sand - Precast Concrete :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Advance Concrete Products Co.]
 - b. [Copeland Precast, Inc.]
 - c. [Oldcastle Infrastructure Inc.; CRH Americas]
 - d. [Wieser Concrete]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Advance Concrete Products Co.]
 - b. [Copeland Precast, Inc.]
 - c. [Oldcastle Infrastructure Inc.; CRH Americas]
 - d. [Wieser Concrete]
 - e. <Insert manufacturer's name>
3. Standard:
 - a. ASTM C913.
 - b. [Specific requirements of the Authority Having Jurisdiction].
4. Description: Factory-fabricated sand interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
5. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain sand and to permit wastewater flow.
6. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
7. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.
 - c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
8. Resilient Pipe Connectors: **ASTM C923 (ASTM C923M)**, cast or fitted into interceptor walls, for each pipe connection.
9. Steps: [Individual FRP steps or FRP ladder][Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP][ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP]<Insert material>, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-

inch (300- to 400-mm) intervals. Omit steps if total depth from floor of interceptor to finished grade is less than [60 inches (1500 mm)]<Insert dimension>.

10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover.
11. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum-width flange and 26-inch- (660-mm-) diameter cover.
 - a. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 - b. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 - c. Include indented top design with lettering cast into cover, using wording equivalent to "[INTERCEPTOR][SAND INTERCEPTOR][SANITARY SEWER]" <Insert lettering>.
12. Capacities and Characteristics:
 - a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Flow Rate: <Insert gpm (L/s)>.
 - c. Capacity: <Insert gal. (L)>.
 - d. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - e. Trapped Outlet: Integral.
 - f. Cleanout: Integral[or field installed on outlet].
 - g. Vent Pipe Size: <Insert NPS (DN)>.
 - h. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.
 - i. Flow-Control Fitting: Required.

B. Interceptors, Sand - Steel :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]
 - f. [Wade; a subsidiary of McWane Inc.]
 - g. [WATTS; A Watts Water Technologies Company]
 - h. [Zurn Industries, LLC]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [ParkUSA; a Northwest Pipe Company]
 - e. [Rockford Separators]

- f. **[Wade; a subsidiary of McWane Inc.]**
 - g. **[WATTS; A Watts Water Technologies Company]**
 - h. **[Zurn Industries, LLC]**
 - i. **<Insert manufacturer's name>**
3. Description: Factory-fabricated sand interceptor, steel body and inlet grate; with settlement chamber and removable basket or strainer made for removing and retaining sand from wastewater.
 4. Body Material: Steel.
 5. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resisting coating.
 6. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacturer's acid-resisting coating.
 7. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
 8. Grate: Cast iron or steel with reinforcement to provide ASTM C890 **[A-03, walkway]<Insert loading type>** load.
 9. Capacities and Characteristics:
 - a. Length by Width by Depth: **<Insert inches (mm)>**.
 - b. Flow Rate: **<Insert gpm (L/s)>**.
 - c. Capacity: **<Insert gal. (L)>**.
 - d. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - e. Trapped Outlet: Integral.
 - f. Cleanout: Integral **[or field installed on outlet]**.
 - g. Vent Pipe Size: **<Insert NPS (DN)>**.
 - h. Installation Position: **[Top flush with grade]<Insert position>**.
- C. Interceptors, Sand - Plastic :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[MIFAB, Inc]**
 - b. **[Striem]**
 - c. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[MIFAB, Inc]**
 - b. **[Striem]**
 - c. **<Insert manufacturer's name>**
 3. Description: Factory-fabricated sand interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
 4. Body Material: Plastic.
 5. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
 6. Extension: Plastic shroud, full size of interceptor, extending from top of interceptor to grade.
 7. Cover: Plastic **[with steel reinforcement to provide ASTM C890][A-03, walkway]<Insert loading type>** load.
 8. Capacities and Characteristics:

- a. Length by Width by Depth: **<Insert inches (mm)>**.
- b. Flow Rate: **<Insert gpm (L/s)>**.
- c. Capacity: **<Insert gal. (L)>**.
- d. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
- e. Waste-Oil-Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
- f. Trapped Outlet: Integral.
- g. Cleanout: Integral[**or field installed on outlet**].
- h. Vent Pipe Size: **<Insert NPS (DN)>**.
- i. Mounting: [**Above floor**][**Recessed in acid-resistant, coated steel frame and cradle**][**Recessed, flush with floor**]**<Insert mounting>**.
- j. Flow-Control Fitting: Required.

2.5 INTERCEPTORS, SAND AND OIL

A. Interceptors, Sand and Oil - Precast Concrete :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Copeland Precast, Inc.]**
 - b. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - c. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Copeland Precast, Inc.]**
 - b. **[Oldcastle Infrastructure Inc.; CRH Americas]**
 - c. **<Insert manufacturer's name>**
3. Standard:
 - a. ASTM C913.
 - b. **[Specific requirements of the Authority Having Jurisdiction]**.
4. Description: Factory-fabricated sand and oil interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
5. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain sand and to permit wastewater flow.
6. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
7. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.

- c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
8. Resilient Pipe Connectors: **ASTM C923 (ASTM C923M)**, cast or fitted into interceptor walls, for each pipe connection.
 9. Steps: **[Individual FRP steps or FRP ladder][Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP][ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP]<Insert material>**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at **12- to 16-inch (300- to 400-mm)** intervals. Omit steps if total depth from floor of interceptor to finished grade is less than **[60 inches (1500 mm)]<Insert dimension>**.
 10. Grade Rings: Reinforced-concrete rings, **6- to 9-inch (150- to 225-mm)** total thickness, to match diameter of manhole frame and cover.
 11. Manhole Frames and Covers: Ferrous; **24-inch (610-mm)** ID by **7- to 9-inch (175- to 225-mm)** riser with **4-inch- (100-mm-)** minimum-width flange and **26-inch- (660-mm-)** diameter cover.
 - a. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 - b. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 - c. Include indented top design with lettering cast into cover, using wording equivalent to **"[INTERCEPTOR][SAND & OIL INTERCEPTOR][SANITARY SEWER]" <Insert lettering>**.
 12. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
 13. Capacities and Characteristics:
 - a. Length by Width by Depth: **<Insert inches (mm)>**.
 - b. Flow Rate: **<Insert gpm (L/s)>**.
 - c. Capacity: **<Insert gal. (L)>**.
 - d. Inlet and Outlet Pipe Size: **<Insert NPS (DN)>**.
 - 1) Centerline of Inlet to Floor: **<Insert inches (mm)>**.
 - 2) Centerline of Outlet to Floor: **<Insert inches (mm)>**.
 - e. Trapped Outlet: Integral.
 - f. Cleanout: Integral **[or field installed on outlet]**.
 - g. Vent Pipe Size: **<Insert NPS (DN)>**.
 - h. Mounting: **[Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>**.
 - i. Flow-Control Fitting: Required.
- B. Interceptors, Sand and Oil - Steel :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Jay R. Smith Mfg Co; a division of Morris Group International]**
 - b. **[Josam Company]**
 - c. **[MIFAB, Inc]**
 - d. **[ParkUSA; a Northwest Pipe Company]**
 - e. **[Rockford Separators]**
 - f. **[Wade; a subsidiary of McWane Inc.]**
 - g. **[WATTS; A Watts Water Technologies Company]**



- h. [Zurn Industries, LLC]
- i. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
- b. [Josam Company]
- c. [MIFAB, Inc]
- d. [ParkUSA; a Northwest Pipe Company]
- e. [Rockford Separators]
- f. [Wade; a subsidiary of McWane Inc.]
- g. [WATTS; A Watts Water Technologies Company]
- h. [Zurn Industries, LLC]
- i. <Insert manufacturer's name>

3. Description: Factory-fabricated sand and oil interceptor with removable basket or strainer, baffles, vents, and flow-control fitting on inlet.
4. Body Material: Steel.
5. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
6. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
7. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
8. Extension: Cast-iron or steel shroud, full size of interceptor, extending from top of interceptor to grade.
9. Cover: Cast iron or steel, with steel reinforcement to provide ASTM C890 [A-03, walkway]<Insert loading type> load.
10. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
11. Capacities and Characteristics:
 - a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Flow Rate: <Insert gpm (L/s)>.
 - c. Capacity: <Insert gal. (L)>.
 - d. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - e. Waste-Oil-Outlet Pipe Size: <Insert NPS (DN)>.
 - 1) Centerline of Outlet to Floor: <Insert inches (mm)>.
 - f. Trapped Outlet: Integral.
 - g. Cleanout: Integral[or field installed on outlet].
 - h. Vent Pipe Size: <Insert NPS (DN)>.
 - i. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.
 - j. Flow-Control Fitting: Required.

C. Interceptors, Sand and Oil - Plastic :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- a. [MIFAB, Inc]
 - b. [Striem]
 - c. [Town & Country Plastics, Inc]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [MIFAB, Inc]
 - b. [Striem]
 - c. [Town & Country Plastics, Inc]
 - d. [Zurn Industries, LLC]
 - e. <Insert manufacturer's name>
3. Description: Factory-fabricated sand and oil interceptor with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
4. Body Material: Plastic.
5. Inlet, Outlet, and Vent Piping Connections: Hub, or no-hub (hubless) unless otherwise indicated.
6. Extension: Plastic shroud, full size of interceptor, extending from top of interceptor to grade.
7. Cover: Plastic[**with steel reinforcement to provide ASTM C890**][A-03, walkway]<Insert loading type> load.
8. Separated liquids and oils are to be collected in a receptacle approved by the Authority Having Jurisdiction.
9. Capacities and Characteristics:
- a. Length by Width by Depth: <Insert inches (mm)>.
 - b. Flow Rate: <Insert gpm (L/s)>.
 - c. Capacity: <Insert gal. (L)>.
 - d. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
- 1) Centerline of Inlet to Floor: <Insert inches (mm)>.
 - 2) Centerline of Outlet to Floor: <Insert inches (mm)>.
- e. Waste-Oil-Outlet Pipe Size: <Insert NPS (DN)>.
- 1) Centerline of Outlet to Floor: <Insert inches (mm)>.
- f. Trapped Outlet: Integral.
 - g. Cleanout: Integral[**or field installed on outlet**].
 - h. Vent Pipe Size: <Insert NPS (DN)>.
 - i. Mounting: [Above floor][Recessed in acid-resistant, coated steel frame and cradle][Recessed, flush with floor]<Insert mounting>.
 - j. Flow-Control Fitting: Required.

2.6 INTERCEPTORS, SOLIDS

A. Interceptors, Solids - Cast Iron, Cast Aluminum, or Steel :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the

following]:

- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Rockford Separators]
 - e. [Wade; a subsidiary of McWane Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [Jay R. Smith Mfg Co; a division of Morris Group International]
 - b. [Josam Company]
 - c. [MIFAB, Inc]
 - d. [Rockford Separators]
 - e. [Wade; a subsidiary of McWane Inc.]
 - f. [WATTS; A Watts Water Technologies Company]
 - g. [Zurn Industries, LLC]
 - h. <Insert manufacturer's name>
3. Description: Factory-fabricated solids interceptor made for removing and retaining [lint][sediment]<Insert solid> from wastewater.
4. Body Material: Cast iron, cast aluminum or steel.
5. Interior Separation Device: [Baffles][Screens]<Insert device>.
6. Interior Lining: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
7. Exterior Coating: Factory-applied epoxy, polyurethane, or manufacturer's acid-resistant coating.
8. Inlet, and Outlet Piping Connections: Threaded unless otherwise indicated.
9. Body Dimensions: <Insert dimensions>.
10. Flow Rate: <Insert gpm (L/s)>.
11. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
12. Mounting: [Above floor][Inline]<Insert mounting>.

B. Interceptors, Solids - Plastic :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Ashland PolyTrap]
 - b. [MIFAB, Inc]
 - c. [Striem]
 - d. [Town & Country Plastics, Inc]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Ashland PolyTrap]

- b. [MIFAB, Inc]
 - c. [Striem]
 - d. [Town & Country Plastics, Inc]
 - e. [Zurn Industries, LLC]
 - f. <Insert manufacturer's name>
3. Description: Factory-fabricated interceptor made for removing and retaining [lint][sediment]<Insert solid> from wastewater.
 4. Body Material: Plastic.
 5. Interior Separation Device: [Baffles][Screens]<Insert device>.
 6. Inlet, and Outlet Piping Connections: Threaded unless otherwise indicated.
 7. Body Dimensions: <Insert dimensions>.
 8. Flow Rate: <Insert gpm (L/s)>.
 9. Inlet and Outlet Pipe Size: <Insert NPS (DN)>.
 10. Mounting: [Above floor][Inline]<Insert mounting>.

2.7 MANHOLE RISERS, FRAMES, AND COVERS

- A. Precast-Concrete Manhole Risers: [ASTM C478 (ASTM C478M)][ASTM C913], with rubber-gasket joints.
 1. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.
 - c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
 2. Length: From top of underground concrete structure to grade.
 3. Riser Sections: 3-inch (75-mm) minimum thickness and [36-inch (915-mm)]<Insert dimension> diameter.
 4. Top Section: Eccentric cone unless otherwise indicated. Include top of cone to match grade ring size.
 5. Gaskets: ASTM C443 (ASTM C443M), rubber.
 6. Steps: [Individual FRP steps or FRP ladder][Individual FRP steps, FRP ladder, or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP][ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP]<Insert material>, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals.
- B. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, diameter matching manhole frame and cover, and height as required to adjust the manhole frame and cover to indicated elevation and slope.
- C. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum-width flange and 26-inch- (660-mm-) diameter cover.
 1. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 2. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 3. Include indented top design with lettering cast into cover, using wording equivalent to the following:
 - a. Grease Interceptors in Sanitary Sewerage System: "[INTERCEPTOR][GREASE INTERCEPTOR][SANITARY SEWER]" <Insert lettering>.

- b. Oil Interceptors in Sanitary Sewerage System: "[INTERCEPTOR][OIL INTERCEPTOR][SANITARY SEWER]" <Insert lettering>.
- c. Sand Interceptors in Sanitary Sewerage System: "[INTERCEPTOR][SAND INTERCEPTOR][SANITARY SEWER]" <Insert lettering>.
- d. Sand and Oil Interceptors in Sanitary Sewerage System: "[INTERCEPTOR][SAND & OIL INTERCEPTOR][SANITARY SEWER]" <Insert lettering>.

2.8 SAMPLING PORTS

A. Sampling Ports - Precast Concrete :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ParkUSA; a Northwest Pipe Company]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [ParkUSA; a Northwest Pipe Company]
 - b. <Insert manufacturer's name>
3. Description: Factory-fabricated sampling port.
4. Body Material: Precast concrete or Class I/II concrete with design strength of **4500 psi (31,026 kPa)** at 28 days.
5. Location: Below grade.
6. Body Interior Diameter: [15-inch (381-mm)][18-inch (458-mm)][24-inch (610-mm)]<Insert dimension> diameter.
7. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.
 - c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
 - d. Walkway Load: Comply with ASTM C890, A-03.
8. Resilient Pipe Connectors: **ASTM C923 (ASTM C923M)**, cast or fitted into walls, for each pipe connection.
9. Grade Rings: Reinforced-concrete rings, **6- to 9-inch (150- to 225-mm)** total thickness, to match diameter of manhole frame and cover.
10. Manhole Frames and Covers:
 - a. Ductile Iron: ASTM A536, Grade 60-40-18, unless otherwise indicated.
 - b. Gray Iron: ASTM A48/A48M, Class 35, unless otherwise indicated.
 - c. Include indented top design with lettering cast into cover, using wording equivalent to "[SAMPLING WELL/PORT]" <Insert lettering>.

B. Sampling Ports - Metal :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ParkUSA; a Northwest Pipe Company]
 - b. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [ParkUSA; a Northwest Pipe Company]
 - b. <Insert manufacturer's name>
3. Description: Factory-fabricated sampling port.
4. Body Material: Type 304 stainless steel conforming with ASTM A480/A480M.
5. Body Diameter: [15-inch (381-mm)][24-inch (610-mm)]<Insert dimension> diameter.
6. Location: [Above grade][In accessible pit].
7. Cover: Removable lid with securing bolts and gasket.
- a. Include indented top design with lettering cast into cover, using wording equivalent to "[SAMPLING WELL/PORT]" <Insert lettering>.

C. Sampling Ports - Plastic :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [MIFAB, Inc]
 - b. [Schier Products Company]
 - c. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [MIFAB, Inc]
 - b. [Schier Products Company]
 - c. <Insert manufacturer's name>
3. Description: Factory-fabricated sampling port.
4. Body Material: Seamless rotationally molded polyethylene or molded HDPE.
5. Body Diameter: [15-inch (381-mm)][18-inch (458-mm)][24-inch (610-mm)]<Insert dimension> diameter.
6. Location: [Above grade][In accessible pit][Below grade].
7. Cover: Water and gas-tight seal.
 - a. Include indented top design with lettering cast into cover, using wording equivalent to "[SAMPLING WELL/PORT]" <Insert lettering>.
8. Body Extension: <Insert inches (mm)> height.
9. Structural Design Loads:
 - a. Light-Traffic Load: Comply with ASTM C890, A-8.
 - b. Medium-Traffic Load: Comply with ASTM C890, A-12.

- c. Heavy-Traffic Load: Comply with ASTM C890, A-16.
- d. Walkway Load: Comply with ASTM C890, A-03.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF SANITARY WASTE INTERCEPTORS

- A. Equipment Mounting:
 - 1. Install **[grease interceptors][grease-removal devices][and][solids interceptors]** on cast-in-place concrete equipment base(s).
 - 2. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
- B. Install precast-concrete interceptors in accordance with ASTM C891.
- C. Set interceptors level and plumb.
- D. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.
- E. Set tops of manhole frames and covers flush with finished surface in pavements.
 - 1. Set tops **[3 inches (75 mm)]<Insert dimension>** above finish surface elsewhere unless otherwise indicated.
- F. Set tops of grating frames and grates flush with finished surface.
- G. Set **[metal][and][plastic]** interceptors level and plumb.
- H. Set tops of metal interceptor covers flush with finished surface in pavements.
 - 1. Set tops **[3 inches (75 mm)]<Insert dimension>** above finish surface elsewhere unless otherwise indicated.
- I. Install captured waste oil piping and waste oil storage tanks in accordance with the requirements of the Authority Having Jurisdiction.
- J. Install grease interceptors, including trapping, venting, and flow-control fitting, in accordance with authorities having jurisdiction and with clear space for servicing.
 - 1. Above-Floor Installation: Set unit with bottom resting on floor unless otherwise indicated.
 - 2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
 - 3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
 - 4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

- K. Install grease-removal devices on floor. Install trap, vent, and flow-control fitting in accordance with authorities having jurisdiction.
 - 1. Install control panel adjacent to unit unless otherwise indicated.
- L. Install oil and sand & oil interceptors, including trapping, venting, and flow-control fitting, in accordance with authorities having jurisdiction and with clear space for servicing.
 - 1. Coordinate captured waste oil storage tank and/or gravity drain with the Authority Having Jurisdiction.
- M. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet.
 - 1. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

3.3 PIPING CONNECTIONS

- A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Make piping connections between interceptors and piping systems.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplates to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplates to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least **1/2 inches (13 mm)** high.

3.5 IDENTIFICATION

- A. Identification materials and installation are specified in Section 312000 "Earth Moving."
 - 1. Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
 - 2. Use warning tapes or detectable warning tape over ferrous piping.
 - 3. Use detectable warning tape over nonferrous piping and over edges of underground structures.
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or

near each of the following:

1. Grease interceptors.
2. Grease-removal devices.
3. Oil and sand, and oil interceptors.
4. Solids interceptors.
5. Sampling ports.

3.6 PROTECTION

- A. Protect sanitary waste interceptors from damage during construction period.
- B. Repair damage to adjacent materials caused by sanitary waste interceptor installation.

END OF SECTION 22 13 23 00



Task	Specification	Specification Description
22 13 23 00	22 13 19 00	Sanitary Waste Piping Specialties
22 13 23 00	22 13 00 00	Facility Gray-Water Storage Tanks



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SECTION 22 13 29 00 - SANITARY SEWERAGE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submersible effluent pumps.
2. Submersible sewage pumps.
3. Wet-pit-volute sewage pumps.
4. Sewage-pump, reverse-flow assemblies.
5. Sewage-pump basins and basin covers.
6. Progressing-cavity sewage pumps.
7. Packaged, submersible sewage-pump units.
8. Packaged wastewater-pump units.

B. Related Requirements:

1. Section 221429 "Sump Pumps" for applications in storm-drainage systems.
2. Section 333200 "Site Packaged Sewage Pumping Stations" for applications in site-construction sewage pumping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. **[Include construction details, material descriptions, dimensions of individual components and profiles.][Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.]**

B. Shop Drawings:

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

- B. Protect bearings and couplings against damage.
- C. Comply with manufacturer's written instructions for handling.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 SUBMERSIBLE EFFLUENT PUMPS

- A. Submersible, Fixed-Position, Single-Seal Effluent Pumps :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Barnes; a Crane Pumps & Systems brand]**
 - c. **[Bell & Gossett; a Xylem brand]**
 - d. **[Flo Fab Inc]**
 - e. **[Goulds Water Technology; a Xylem brand]**
 - f. **[GRUNDFOS CBS Inc.]**
 - g. **[Liberty Pumps]**
 - h. **[Little Giant; a brand of Franklin Electric Co., Inc.]**
 - i. **[Pentair Aurora; Pentair Pump Group]**
 - j. **[ProFlo; a Ferguson Enterprises, Inc. brand]**
 - k. **[Sta-Rite Industries, Inc.; Pentair Ltd.]**
 - l. **[Stancor, Inc]**
 - m. **[WILO-EMU USA LLC]**
 - n. **[Zoeller Company]**
 - o. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Barnes; a Crane Pumps & Systems brand]**
 - c. **[Bell & Gossett; a Xylem brand]**
 - d. **[Flo Fab Inc]**

- e. [Goulds Water Technology; a Xylem brand]
 - f. [GRUNDFOS CBS Inc.]
 - g. [Liberty Pumps]
 - h. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - i. [Pentair Aurora; Pentair Pump Group]
 - j. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - k. [Sta-Rite Industries, Inc.; Pentair Ltd.]
 - l. [Stancor, Inc]
 - m. [WILO-EMU USA LLC]
 - n. [Zoeller Company]
 - o. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested effluent-pump unit.
 4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
 6. Impeller: Statically and dynamically balanced, [ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel], closed or semiopen design for clear wastewater, and keyed and secured to shaft.
 7. Pump and Motor Shaft: Stainless steel[or steel], with factory-sealed, grease-lubricated ball bearings.
 8. Seal: Mechanical.
 9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: [Air][Oil].
 10. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 11. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
 - b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 12. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to

building automation system and capable of providing the following:

- 1) On-off status of pump.
- 2) Alarm status.

B. Submersible, Fixed-Position, Double-Seal Effluent Pumps :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[BJM Pumps, LLC]**
 - c. **[Federal Pump Corp]**
 - d. **[HOMA Pump Technology Inc.]**
 - e. **[KSB Inc.]**
 - f. **[Liberty Pumps]**
 - g. **[Pentair Aurora; Pentair Pump Group]**
 - h. **[PX Pumps USA]**
 - i. **[Stancor, Inc]**
 - j. **[Tsurumi America, Inc.]**
 - k. **[WILO-EMU USA LLC]**
 - l. **[Zoeller Company]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[BJM Pumps, LLC]**
 - c. **[Federal Pump Corp]**
 - d. **[HOMA Pump Technology Inc.]**
 - e. **[KSB Inc.]**
 - f. **[Liberty Pumps]**
 - g. **[Pentair Aurora; Pentair Pump Group]**
 - h. **[PX Pumps USA]**
 - i. **[Stancor, Inc]**
 - j. **[Tsurumi America, Inc.]**
 - k. **[WILO-EMU USA LLC]**
 - l. **[Zoeller Company]**
 - m. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested effluent-pump unit.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.
5. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, closed or semiopen design for clear wastewater, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel[**or steel**], with factory-sealed, grease-lubricated ball bearings.

8. Seals: Mechanical.
9. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
10. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
11. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
12. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
13. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

C. Submersible, Quick-Disconnect, Single-Seal Effluent Pumps :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Liberty Pumps]**
 - b. **[Pentair Aurora; Pentair Pump Group]**
 - c. **[Stancor, Inc]**
 - d. **[WILO-EMU USA LLC]**
 - e. **[Zoeller Company]**
 - f. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Liberty Pumps]**
 - b. **[Pentair Aurora; Pentair Pump Group]**
 - c. **[Stancor, Inc]**
 - d. **[WILO-EMU USA LLC]**
 - e. **[Zoeller Company]**
 - f. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested effluent-pump unit with guide-rail supports.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.
5. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, closed or semiopen design for clear wastewater, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
8. Seal: Mechanical.
9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
10. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
11. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
12. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

13. Guide-Rail Supports:

- a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
- b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
- c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
- d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
- e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
- f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
- g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

D. Submersible, Quick-Disconnect, Double-Seal Effluent Pumps :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 - c. **[Federal Pump Corp]**
 - d. **[Flygt; a brand of Xylem Inc.]**
 - e. **[HOMA Pump Technology Inc.]**
 - f. **[Liberty Pumps]**
 - g. **[Pentair Aurora; Pentair Pump Group]**
 - h. **[PX Pumps USA]**
 - i. **[Stancor, Inc]**
 - j. **[Tsurumi America, Inc.]**
 - k. **[WILO-EMU USA LLC]**
 - l. **[Zoeller Company]**
 - m. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 - c. **[Federal Pump Corp]**
 - d. **[Flygt; a brand of Xylem Inc.]**
 - e. **[HOMA Pump Technology Inc.]**
 - f. **[Liberty Pumps]**
 - g. **[Pentair Aurora; Pentair Pump Group]**
 - h. **[PX Pumps USA]**
 - i. **[Stancor, Inc]**
 - j. **[Tsurumi America, Inc.]**
 - k. **[WILO-EMU USA LLC]**
 - l. **[Zoeller Company]**
 - m. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested effluent-pump unit with guide-rail supports.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.



5. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, closed or semiopen design for clear wastewater, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
8. Seals: Mechanical.
9. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
10. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
11. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
12. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
13. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
14. Guide-Rail Supports:
 - a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
 - b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
 - c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
 - d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump

- during connection of flanges.
- e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
- f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
- g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

E. Capacities and Characteristics:

1. Unit Capacity: <Insert value> gpm (L/min.).
2. Number of Pumps: [One][Two]<Insert value>.
3. Each Pump:
 - a. Capacity: <Insert value> gpm (L/min.).
 - b. Solids Handling Capability: [Not applicable][2 inches (50 mm) minimum][2-1/2 inches (65 mm) minimum][3 inches (75 mm) minimum]<Insert inches (mm) minimum>.
 - c. Total Dynamic Head: <Insert value>feet (kPa).
 - d. Speed: <Insert rpm>.
 - e. Discharge Pipe Size: <Insert value> NPS (DN).
 - f. Motor Horsepower: <Insert value> hp.
 - g. Electrical Characteristics:
 - 1) Volts: [120][240][277][480]<Insert value> V ac.
 - 2) Phases: [Single][Three].
 - 3) Hertz: 60.
4. Unit Electrical Characteristics:
 - a. Full-Load Amperes: <Insert value> A.
 - b. Minimum Circuit Ampacity: <Insert value> A.
 - c. Maximum Overcurrent Protection: <Insert value> A.

2.3 SUBMERSIBLE SEWAGE PUMPS

A. Submersible, Fixed-Position, Single-Seal Sewage Pumps :

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Bell & Gossett; a Xylem brand]
 - c. [EBARA Pumps Americas Corp.]
 - d. [Flo Fab Inc]
 - e. [Flygt; a brand of Xylem Inc.]
 - f. [Goulds Water Technology; a Xylem brand]
 - g. [GRUNDFOS CBS Inc.]
 - h. [Liberty Pumps]
 - i. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - j. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - k. [Peerless Pump Company]
 - l. [Pentair Aurora; Pentair Pump Group]
 - m. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - n. [Swaby Manufacturing Company]
 - o. [Weil Pump; a Wilo Company]

- p. [Weinman; a Crane Pumps & Systems brand]
 - q. [WILO-EMU USA LLC]
 - r. [Zoeller Company]
 - s. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [A.Y. McDonald Mfg. Co.]
 - b. [Bell & Gossett; a Xylem brand]
 - c. [EBARA Pumps Americas Corp.]
 - d. [Flo Fab Inc]
 - e. [Flygt; a brand of Xylem Inc.]
 - f. [Goulds Water Technology; a Xylem brand]
 - g. [GRUNDFOS CBS Inc.]
 - h. [Liberty Pumps]
 - i. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - j. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - k. [Peerless Pump Company]
 - l. [Pentair Aurora; Pentair Pump Group]
 - m. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - n. [Swaby Manufacturing Company]
 - o. [Weil Pump; a Wilo Company]
 - p. [Weinman; a Crane Pumps & Systems brand]
 - q. [WILO-EMU USA LLC]
 - r. [Zoeller Company]
 - s. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested sewage-pump unit.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
5. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
6. Impeller: Statically and dynamically balanced, [ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel], nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel[or steel], with factory-sealed, grease-lubricated ball bearings.
8. Seal: Mechanical.
9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
- a. Motor Housing Fluid: [Air][Oil].
10. Controls, Rod-and-Float Type:
- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.

- e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
11. Controls, Float- and Pressure-Switch Type:
- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
 - b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
12. Control-Interface Features:
- a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
- B. Submersible, Fixed-Position, Double-Seal Sewage Pumps :
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [ABS; Cardo Flow Solutions]
 - b. [Barnes; a Crane Pumps & Systems brand]
 - c. [Bell & Gossett; a Xylem brand]
 - d. [BJM Pumps, LLC]
 - e. [Chicago Pump Company; Grundfos Pumps Corporation]
 - f. [E.I.M. Electric Co., Ltd.]
 - g. [EBARA Pumps Americas Corp.]
 - h. [Federal Pump Corp]
 - i. [Flygt; a brand of Xylem Inc.]
 - j. [Goulds Water Technology; a Xylem brand]
 - k. [HOMA Pump Technology Inc.]
 - l. [KSB Inc.]
 - m. [Liberty Pumps]
 - n. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - o. [Pentair Aurora; Pentair Pump Group]
 - p. [PX Pumps USA]
 - q. [Sta-Rite Industries, Inc.; Pentair Ltd.]
 - r. [Stancor, Inc]
 - s. [Swaby Manufacturing Company]
 - t. [Weil Pump; a Wilo Company]
 - u. [Weinman; a Crane Pumps & Systems brand]
 - v. [WILO-EMU USA LLC]
 - w. [Zoeller Company]
 - x. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert

manufacturer's name; product name or designation> or comparable product by one of the following:

- a. **[ABS; Cardo Flow Solutions]**
 - b. **[Barnes; a Crane Pumps & Systems brand]**
 - c. **[Bell & Gossett; a Xylem brand]**
 - d. **[BJM Pumps, LLC]**
 - e. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 - f. **[E.I.M. Electric Co., Ltd.]**
 - g. **[EBARA Pumps Americas Corp.]**
 - h. **[Federal Pump Corp]**
 - i. **[Flygt; a brand of Xylem Inc.]**
 - j. **[Goulds Water Technology; a Xylem brand]**
 - k. **[HOMA Pump Technology Inc.]**
 - l. **[KSB Inc.]**
 - m. **[Liberty Pumps]**
 - n. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
 - o. **[Pentair Aurora; Pentair Pump Group]**
 - p. **[PX Pumps USA]**
 - q. **[Sta-Rite Industries, Inc.; Pentair Ltd.]**
 - r. **[Stancor, Inc]**
 - s. **[Swaby Manufacturing Company]**
 - t. **[Weil Pump; a Wilo Company]**
 - u. **[Weinman; a Crane Pumps & Systems brand]**
 - v. **[WILO-EMU USA LLC]**
 - w. **[Zoeller Company]**
 - x. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested sewage-pump unit.
 4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
 6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
 7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
 8. Seals: Mechanical.
 9. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
 10. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
 11. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.

- e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
12. Controls, Float- and Pressure-Switch Type:
- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
 - b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
13. Control-Interface Features:
- a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
- C. Submersible, Quick-Disconnect, Single-Seal Sewage Pumps :
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [EBARA Pumps Americas Corp.]
 - b. [Flygt; a brand of Xylem Inc.]
 - c. [Gorman-Rupp Company (The)]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Liberty Pumps]
 - f. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - g. [Pentair Aurora; Pentair Pump Group]
 - h. [Swaby Manufacturing Company]
 - i. [Weil Pump; a Wilo Company]
 - j. [WILO-EMU USA LLC]
 - k. [Zoeller Company]
 - l. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [EBARA Pumps Americas Corp.]
 - b. [Flygt; a brand of Xylem Inc.]
 - c. [Gorman-Rupp Company (The)]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Liberty Pumps]
 - f. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - g. [Pentair Aurora; Pentair Pump Group]
 - h. [Swaby Manufacturing Company]
 - i. [Weil Pump; a Wilo Company]

- j. **[WILO-EMU USA LLC]**
 - k. **[Zoeller Company]**
 - l. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested sewage-pump unit with guide-rail supports.
 4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
 6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
 7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
 8. Seal: Mechanical.
 9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
 10. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 11. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 12. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
 13. Guide-Rail Supports:

- a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
- b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
- c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
- d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
- e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
- f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
- g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

D. Submersible, Quick-Disconnect, Double-Seal Sewage Pumps :

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[Barnes; a Crane Pumps & Systems brand]**
 - c. **[Bell & Gossett; a Xylem brand]**
 - d. **[BJM Pumps, LLC]**
 - e. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 - f. **[E.I.M. Electric Co., Ltd.]**
 - g. **[EBARA Pumps Americas Corp.]**
 - h. **[Federal Pump Corp]**
 - i. **[Flygt; a brand of Xylem Inc.]**
 - j. **[Gorman-Rupp Company (The)]**
 - k. **[Goulds Water Technology; a Xylem brand]**
 - l. **[HOMA Pump Technology Inc.]**
 - m. **[KSB Inc.]**
 - n. **[Liberty Pumps]**
 - o. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
 - p. **[Pentair Aurora; Pentair Pump Group]**
 - q. **[PX Pumps USA]**
 - r. **[Sta-Rite Industries, Inc.; Pentair Ltd.]**
 - s. **[Stancor, Inc]**
 - t. **[Swaby Manufacturing Company]**
 - u. **[Tsurumi America, Inc.]**
 - v. **[Weil Pump; a Wilo Company]**
 - w. **[Weinman; a Crane Pumps & Systems brand]**
 - x. **[WILO-EMU USA LLC]**
 - y. **[Zoeller Company]**
 - z. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[Barnes; a Crane Pumps & Systems brand]**
 - c. **[Bell & Gossett; a Xylem brand]**
 - d. **[BJM Pumps, LLC]**
 - e. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 - f. **[E.I.M. Electric Co., Ltd.]**

- g. **[EBARA Pumps Americas Corp.]**
 - h. **[Federal Pump Corp]**
 - i. **[Flygt; a brand of Xylem Inc.]**
 - j. **[Gorman-Rupp Company (The)]**
 - k. **[Goulds Water Technology; a Xylem brand]**
 - l. **[HOMA Pump Technology Inc.]**
 - m. **[KSB Inc.]**
 - n. **[Liberty Pumps]**
 - o. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
 - p. **[Pentair Aurora; Pentair Pump Group]**
 - q. **[PX Pumps USA]**
 - r. **[Sta-Rite Industries, Inc.; Pentair Ltd.]**
 - s. **[Stancor, Inc]**
 - t. **[Swaby Manufacturing Company]**
 - u. **[Tsurumi America, Inc.]**
 - v. **[Weil Pump; a Wilo Company]**
 - w. **[Weinman; a Crane Pumps & Systems brand]**
 - x. **[WILO-EMU USA LLC]**
 - y. **[Zoeller Company]**
 - z. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested sewage-pump unit with guide-rail supports.
 4. Pump type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
 6. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][ASTM B584, cast bronze][and][stainless steel]**, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
 7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
 8. Seals: Mechanical.
 9. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
 10. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
 11. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 12. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA

- 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
13. Control-Interface Features:
- a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
14. Guide-Rail Supports:
- a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
 - b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
 - c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
 - d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
 - e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
 - f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
 - g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.
- E. Submersible, Quick-Disconnect, Grinder Sewage Pumps :
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[ABS; Cardo Flow Solutions]**
 - b. **[Alyan Pump Company]**
 - c. **[Barnes; a Crane Pumps & Systems brand]**
 - d. **[BJM Pumps, LLC]**
 - e. **[EBARA Pumps Americas Corp.]**
 - f. **[HOMA Pump Technology Inc.]**
 - g. **[Liberty Pumps]**
 - h. **[Pentair Aurora; Pentair Pump Group]**
 - i. **[Stancor, Inc]**
 - j. **[Tsurumi America, Inc.]**
 - k. **[Vaughan Co., Inc.]**
 - l. **[Weil Pump; a Wilo Company]**
 - m. **[WILO-EMU USA LLC]**
 - n. **[Zoeller Company]**
 - o. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. [ABS; Cardo Flow Solutions]
 - b. [Alyan Pump Company]
 - c. [Barnes; a Crane Pumps & Systems brand]
 - d. [BJM Pumps, LLC]
 - e. [EBARA Pumps Americas Corp.]
 - f. [HOMA Pump Technology Inc.]
 - g. [Liberty Pumps]
 - h. [Pentair Aurora; Pentair Pump Group]
 - i. [Stancor, Inc]
 - j. [Tsurumi America, Inc.]
 - k. [Vaughan Co., Inc.]
 - l. [Weil Pump; a Wilo Company]
 - m. [WILO-EMU USA LLC]
 - n. [Zoeller Company]
 - o. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested, grinder sewage-pump unit with guide-rail supports.
 4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail supports.
 6. Impeller: Bronze or stainless steel; statically and dynamically balanced, with stainless-steel cutter, grinder, or slicer assembly; capable of handling solids; and keyed and secured to shaft.
 7. Pump and Motor Shaft: Stainless steel[**or steel**], with factory-sealed, grease-lubricated ball bearings.
 8. Seal: Mechanical.
 9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: [Air][Oil].
 10. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 11. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
 - b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 12. Control-Interface Features:

- a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
13. Guide-Rail Supports:
- a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
 - b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
 - c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
 - d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
 - e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
 - f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
 - g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.
- F. Submersible, Quick-Disconnect, Progressing-Cavity, Grinder Sewage Pumps :
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[Barnes; a Crane Pumps & Systems brand]**
 - b. **[Environment One Corporation]**
 - c. **[Pentair Aurora; Pentair Pump Group]**
 - d. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Barnes; a Crane Pumps & Systems brand]**
 - b. **[Environment One Corporation]**
 - c. **[Pentair Aurora; Pentair Pump Group]**
 - d. **<Insert manufacturer's name>**
 3. Description: Factory-assembled and -tested, progressing-cavity, grinder sewage-pump unit with guide-rail supports.
 4. Pump Type: Submersible, progressing-cavity, single-screw rotary, grinder sewage pump as defined in HI 3.1-3.5.
 5. Pump Body: **[Cast iron]<Insert material>**.
 6. Pump Bearings: Radial and thrust types.
 7. Pump Shaft: Steel.
 8. Rotor: Stainless steel.
 9. Stator: **[Buna-N][or][natural rubber]<Insert material>**.
 10. Seal: Packing gland and mechanical types.
 11. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 12. Controls, Rod-and-Float Type:

- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>.
- b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
- c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
- d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
- e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

13. Controls, Float- and Pressure-Switch Type:

- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
- b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
- c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
- d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

14. Control-Interface Features:

- a. Remote Alarm Contacts: For remote alarm interface.
- b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

15. Guide-Rail Supports:

- a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
- b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
- c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
- d. Pump Yoke: Motor- or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
- e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
- f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
- g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

G. Capacities and Characteristics:

- 1. Unit Capacity: <Insert value> gpm (L/min.).
- 2. Number of Pumps: [One][Two]<Insert value>.
- 3. Each Pump:
 - a. Capacity: <Insert value> gpm (L/min.).
 - b. Solids Handling Capability: [Not applicable][2 inches (50 mm) minimum][2-1/2 inches (65 mm) minimum][3 inches (75 mm) minimum]<Insert inches (mm) minimum>.
 - c. Total Dynamic Head: <Insert value> feet (kPa).
 - d. Speed: <Insert rpm>.
 - e. Discharge Pipe Size: <Insert value> NPS (DN).

- f. Motor Horsepower: <Insert value> hp.
- g. Electrical Characteristics:
 - 1) Volts: [120][240][277][480]<Insert value> V ac.
 - 2) Phases: [Single][Three].
 - 3) Hertz: 60.
- 4. Unit Electrical Characteristics:
 - a. Full-Load Amperes: <Insert value> A.
 - b. Minimum Circuit Ampacity: <Insert value> A.
 - c. Maximum Overcurrent Protection: <Insert value> A.

2.4 WET-PIT-VOLUTE SEWAGE PUMPS

- A. Description: Factory-assembled and -tested sewage-pump unit.
- B. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [Alyan Pump Company]
 - 2. [Armstrong Fluid Technology]
 - 3. [Chicago Pump Company; Grundfos Pumps Corporation]
 - 4. [Federal Pump Corp]
 - 5. [Flo Fab Inc]
 - 6. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - 7. [Peerless Pump Company]
 - 8. [Pentair Aurora; Pentair Pump Group]
 - 9. [Swaby Manufacturing Company]
 - 10. [Tramco Pump Company]
 - 11. [Vertiflo Pump Company]
 - 12. [Weil Pump; a Wilo Company]
 - 13. [Weinman; a Crane Pumps & Systems brand]
 - 14. [Yeomans Chicago Corporation]
 - 15. <Insert manufacturer's name>
- C. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [Alyan Pump Company]
 - 2. [Armstrong Fluid Technology]
 - 3. [Chicago Pump Company; Grundfos Pumps Corporation]
 - 4. [Federal Pump Corp]
 - 5. [Flo Fab Inc]
 - 6. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - 7. [Peerless Pump Company]
 - 8. [Pentair Aurora; Pentair Pump Group]
 - 9. [Swaby Manufacturing Company]
 - 10. [Tramco Pump Company]
 - 11. [Vertiflo Pump Company]
 - 12. [Weil Pump; a Wilo Company]
 - 13. [Weinman; a Crane Pumps & Systems brand]
 - 14. [Yeomans Chicago Corporation]
 - 15. <Insert manufacturer's name>

- D. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
- E. Pump Casing: Cast iron, with open inlet and threaded or flanged connection for discharge piping.
- F. Pump Shaft: **[Stainless steel][and][steel]**.
- G. Impeller: Statically and dynamically balanced, **[ASTM A48/A48M, Class No. 25 A cast iron][ASTM A532/A532M, abrasion-resistant cast iron][and][ASTM B584, cast bronze]**, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
- H. Sleeve Bearings: Bronze. Include oil-lubricated, intermediate sleeve bearings at **48-inch- (1200-mm-)** maximum intervals if basin depth is more than **48 inches (1200 mm)**, and grease-lubricated, ball-type thrust bearings.
- I. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- J. Pump Discharge Piping: Factory or field fabricated, **[galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.1, Class 125, cast-iron flanges and flanged fittings or ASME B16.4, Class 125, gray-iron threaded fittings]<Insert pipe material>**.
 - 1. Revise piping configuration to accommodate reverse-flow assembly.
- K. Support Plate: Cast iron or coated steel; strong enough to support pumps, motors, and controls. See "Sewage-Pump Basins and Basin Covers" Article for requirements.
- L. Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.
- M. Motor: Single speed; grease-lubricated ball bearings and mounted on vertical, cast-iron pedestal.
- N. Controls, Rod-and-Float Type:
 - 1. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - 2. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - 3. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - 4. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - 5. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
- O. Controls, Float- and Pressure-Switch Type:
 - 1. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - 2. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - 3. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - 4. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
- P. Control-Interface Features:

1. Remote Alarm Contacts: For remote alarm interface.
2. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - a. On-off status of pump.
 - b. Alarm status.

Q. Capacities and Characteristics:

1. Unit Capacity: **<Insert value> gpm (L/min.)**.
2. Number of Pumps: **[One][Two]<Insert value>**.
3. Each Pump:
 - a. Capacity: **<Insert value> gpm (L/min.)**.
 - b. Solids Handling Capability: **[2 inches (50 mm)][2-1/2 inches (65 mm)][3 inches (75 mm)]<Insert inches (mm)> minimum**.
 - c. Total Dynamic Head: **<Insert value> feet (kPa)**.
 - d. Speed: **<Insert rpm>**.
 - e. Discharge Pipe Size: **<Insert value> NPS (DN)**.
 - f. Motor Horsepower: **<Insert value> hp**.
 - g. Electrical Characteristics:
 - 1) Volts: **[120][240][277][480]<Insert value> V ac**.
 - 2) Phases: **[Single][Three]**.
 - 3) Hertz: 60.
4. Unit Electrical Characteristics:
 - a. Full-Load Amperes: **<Insert value> A**.
 - b. Minimum Circuit Ampacity: **<Insert value> A**.
 - c. Maximum Overcurrent Protection: **<Insert value> A**.

2.5 SEWAGE-PUMP, REVERSE-FLOW ASSEMBLIES

- A. Description: Factory-fabricated, sewage pump reverse-flow assembly for factory or field assembly and installation in sewage pump basin.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 1. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 2. **[Federal Pump Corp]**
 3. **[PACO Pumps; Grundfos Pumps Corporation, USA]**
 4. **[Peerless Pump Company]**
 5. **[Weil Pump; a Wilo Company]**
 6. **[Yeomans Chicago Corporation]**
 7. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Chicago Pump Company; Grundfos Pumps Corporation]**
 2. **[Federal Pump Corp]**
 3. **[PACO Pumps; Grundfos Pumps Corporation, USA]**

4. **[Peerless Pump Company]**
5. **[Weil Pump; a Wilo Company]**
6. **[Yeomans Chicago Corporation]**
7. **<Insert manufacturer's name>**

D. Components: Include the following corrosion-resistant-metal components:

1. Inlet Fitting: One combination inlet-overflow strainer fitting.
2. Valves: Two shutoff valves and two check valves.
3. Strainers: Two strainer housings with reverse-flow, self-flushing strainers.
4. Pipe and Fittings: Size and configuration required to connect to sewage pumps and piping.

2.6 SEWAGE-PUMP BASINS AND BASIN COVERS

A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.

1. Material: **[Cast iron][Fiberglass][Polyethylene]<Insert material>**.
2. Reinforcement: Mounting plates for pumps, fittings[, **guide-rail supports if used,**] and accessories.
3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.

B. Basin Covers: Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

C. Capacities and Characteristics:

1. Capacity: **<Insert value> gal. (L)**.
2. Diameter: **<Insert value> inches (mm)**.
3. Depth: **<Insert value> inches (mm)**.
4. Inlet No. 1:
 - a. Drainage Pipe Size: **<Insert value> NPS (DN)**.
 - b. Bottom of Sump to Centerline: **<Insert value> inches (mm)**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
5. Inlet No. 2:
 - a. Drainage Pipe Size: **<Insert value> NPS (DN)**.
 - b. Bottom of Sump to Centerline: **<Insert value> inches (mm)**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
6. Inlet No. 3:
 - a. Drainage Pipe Size: **<Insert value> NPS (DN)**.
 - b. Bottom of Sump to Centerline: **<Insert value> inches (mm)**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
7. Sidewall Outlet:

- a. Discharge Pipe Size: **<Insert value> NPS (DN).**
- b. Bottom of Sump to Centerline: **<Insert value> inches (mm).**
- c. Type: **[Hubbed inside][Hubbed outside]<Insert type>.**
8. Cover Material: **[Cast iron][Steel with bituminous coating][Cast iron or steel with bituminous coating]<Insert material>.**
9. Cover Diameter: **<Insert value> inches (mm),** but not less than outside diameter of basin top flange.
10. Manhole Required in Cover: **[Yes][No].**
11. Vent Size: **<Insert value> NPS (DN).**

2.7 PROGRESSING-CAVITY SEWAGE PUMPS

- A. Description: Factory-assembled and -tested, progressing-cavity, single-screw rotary pump as defined in HI 3.1-3.5.
- B. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 1. **[Continental Pump Co.]**
 2. **[Moyno, Inc.]**
 3. **[Roper Pump Co.]**
 4. **<Insert manufacturer's name>**
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. **[Continental Pump Co.]**
 2. **[Moyno, Inc.]**
 3. **[Roper Pump Co.]**
 4. **<Insert manufacturer's name>**
- D. Pump Body: **[Cast iron]<Insert material>** with feet for base or floor installation.
- E. Pump Bearings: Radial and thrust types.
- F. Pump Shaft: Steel.
- G. Rotor: **[Chrome-plated steel]<Insert material>.**
- H. Stator: **[Buna-N][or][natural rubber]<Insert material>.**
- I. Seals: Packing gland and mechanical types.
- J. Coupling: Flexible.
- K. Motor: Single speed; grease-lubricated ball bearings.
- L. Capacities and Characteristics:
 1. Capacity: **<Insert value>gal. (L/min.).**
 2. Solids Handling Capability: **[Not applicable][2 inches (50 mm) minimum][2-1/2 inches (65 mm) minimum][3 inches (75 mm) minimum]<Insert inches (mm) minimum>.**

3. Total Dynamic Head: <Insert value> feet (kPa).
4. Speed: <Insert rpm>.
5. Discharge Pipe Size: <Insert value> NPS (DN).
6. Motor Horsepower: <Insert value> hp.
7. Electrical Characteristics:
 - a. Volts: [120][240][277][480]<Insert value> V ac.
 - b. Phases: [Single][Three].
 - c. Hertz: 60.
8. Unit Electrical Characteristics:
 - a. Full-Load Amperes: <Insert value> A.
 - b. Minimum Circuit Ampacity: <Insert value> A.
 - c. Maximum Overcurrent Protection: <Insert value> A.

2.8 PACKAGED, SUBMERSIBLE SEWAGE-PUMP UNITS

A. Packaged, Submersible, Grinder, Sewage-Pump Units:

1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, grinder sewage-pump unit.
2. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Barnes; a Crane Pumps & Systems brand]
 - c. [Environment One Corporation]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Liberty Pumps]
 - f. [Pentair Aurora; Pentair Pump Group]
 - g. [SFA Saniflo USA]
 - h. [Zoeller Company]
 - i. <Insert manufacturer's name>
3. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Barnes; a Crane Pumps & Systems brand]
 - c. [Environment One Corporation]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Liberty Pumps]
 - f. [Pentair Aurora; Pentair Pump Group]
 - g. [SFA Saniflo USA]
 - h. [Zoeller Company]
 - i. <Insert manufacturer's name>
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
5. Pump Casing: Cast iron.

6. Impeller: Stainless-steel grinder[, **cutter, or slicer**] type with shredding ring.
7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
8. Controls for Simplex Pump: Manufacturer's standard panel for one pump.
9. Controls for Duplex Pump: Automatic, with mechanical- or mercury-float switches and alternator.
10. Pump Discharge Piping: Factory or field fabricated, [**galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings**]<Insert pipe material>.
11. Basin: Watertight[**plastic**] and of size required for pumps, with inlet pipe connection and gastight cover with pump discharge and vent connections.

B. Packaged, Submersible, Nonclog, Sewage-Pump Units :

1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, sewage-pump unit.
2. Manufacturers: Subject to compliance with requirements, [**provide products by the following**][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Barnes; a Crane Pumps & Systems brand]
 - c. [Bell & Gossett; a Xylem brand]
 - d. [Glentronics, Inc.]
 - e. [Goulds Water Technology; a Xylem brand]
 - f. [GRUNDFOS CBS Inc.]
 - g. [Liberty Pumps]
 - h. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - i. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - j. [Pentair Aurora; Pentair Pump Group]
 - k. [Sta-Rite Industries, Inc.; Pentair Ltd.]
 - l. [Zoeller Company]
 - m. <Insert manufacturer's name>
3. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Barnes; a Crane Pumps & Systems brand]
 - c. [Bell & Gossett; a Xylem brand]
 - d. [Glentronics, Inc.]
 - e. [Goulds Water Technology; a Xylem brand]
 - f. [GRUNDFOS CBS Inc.]
 - g. [Liberty Pumps]
 - h. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - i. [PACO Pumps; Grundfos Pumps Corporation, USA]
 - j. [Pentair Aurora; Pentair Pump Group]
 - k. [Sta-Rite Industries, Inc.; Pentair Ltd.]
 - l. [Zoeller Company]
 - m. <Insert manufacturer's name>
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
5. Pump Casing: Cast iron.

6. Impeller: Brass or cast iron; statically and dynamically balanced, non-clog design, and capable of handling **2-inch- (50-mm-)** diameter solids.
7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
8. Controls for Simplex Pump: Manufacturer's standard panel for one pump.
9. Controls for Duplex Pump: Automatic, with mechanical- or mercury-float switches and alternator.
10. Pump Discharge Piping: Factory or field fabricated, **[galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings]****<Insert pipe material>**.
11. Basin: Watertight**[plastic]** and of size required for pumps, with inlet pipe connection and gastight cover with pump discharge and vent connections.

C. Capacities and Characteristics:

1. System Capacity: **<Insert value>gal. (L/min.)**.
2. Number of Pumps: **[One][Two]**.
3. Each Pump:
 - a. Capacity: **<Insert value>gal. (L/min.)**.
 - b. Total Dynamic Head: **<Insert value> feet (kPa)**.
 - c. Speed: **<Insert rpm>**.
 - d. Discharge Pipe Size: **<Insert value> NPS (DN)**.
 - e. Motor Horsepower: **<Insert value> hp**.
 - f. Electrical Characteristics:
 - 1) Volts: **[120][240][277][480]<Insert value> V ac**.
 - 2) Phases: **[Single][Three]**.
 - 3) Hertz: 60.
4. Unit Electrical Characteristics:
 - a. Full-Load Amperes: **<Insert value> A**.
 - b. Minimum Circuit Ampacity: **<Insert value> A**.
 - c. Maximum Overcurrent Protection: **<Insert value> A**.
5. Alternator Control Required: **[Yes][No]**.
6. Basin:
 - a. Dimensions: **<Insert values>**.
 - b. Inlet Size: **<Insert value> NPS (DN)**.
 - c. Bottom to Inlet Centerline: **<Insert value> inches (mm)**.
 - d. Vent Size: **<Insert value> NPS (DN)**.

2.9 PACKAGED WASTEWATER-PUMP UNITS

A. Packaged, Wet-Pit-Volute, Wastewater-Pump Units:

1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, effluent-pump unit.
2. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. [Alyan Pump Company]
 - b. [Federal Pump Corp]
 - c. [Hartell Pumps; Milton Roy]
 - d. <Insert manufacturer's name>
 3. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Alyan Pump Company]
 - b. [Federal Pump Corp]
 - c. [Hartell Pumps; Milton Roy]
 - d. <Insert manufacturer's name>
 4. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
 5. Pump Body and Impeller: Corrosion-resistant materials.
 6. Motor: With built-in overload protection and mounted vertically on basin cover.
 7. Power Cord: Three-conductor, waterproof cable of length required, but not less than **72 inches (1830 mm)** and with grounding plug and cable-sealing assembly for connection at pump.
 8. Control: Float switch.
 9. Pump Discharge Piping: Factory or field fabricated, [galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings]<Insert pipe material>.
 10. Basin: Watertight, aluminum, plastic, or coated steel with inlet pipe connection and gastight cover with vent and pump discharge connections.
- B. Packaged, Submersible Wastewater-Pump Units:
1. Description: Factory-assembled and -tested, automatic-operation, effluent-pump unit with basin.
 2. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [ABS; Cardo Flow Solutions]
 - c. [Bell & Gossett; a Xylem brand]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [GRUNDFOS CBS Inc.]
 - f. [Liberty Pumps]
 - g. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - h. [Pentair Aurora; Pentair Pump Group]
 - i. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - j. [SFA Saniflo USA]
 - k. [Sta-Rite Industries, Inc.; Pentair Ltd.]
 - l. [Zoeller Company]
 - m. <Insert manufacturer's name>
 3. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [ABS; Cardo Flow Solutions]
 - c. [Bell & Gossett; a Xylem brand]

- d. [Goulds Water Technology; a Xylem brand]
- e. [GRUNDFOS CBS Inc.]
- f. [Liberty Pumps]
- g. [Little Giant; a brand of Franklin Electric Co., Inc.]
- h. [Pentair Aurora; Pentair Pump Group]
- i. [ProFlo; a Ferguson Enterprises, Inc. brand]
- j. [SFA Saniflo USA]
- k. [Sta-Rite Industries, Inc.; Pentair Ltd.]
- l. [Zoeller Company]
- m. <Insert manufacturer's name>

- 4. Pump Type: Submersible, end-suction, single-stage, overhung-impeller, centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
- 5. Pump Body and Impeller: Corrosion-resistant materials.
- 6. Pump Seals: Mechanical.
- 7. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection.
- 8. Power Cord: Three-conductor, waterproof cable of length required, but not less than **72 inches (1830 mm)** and with grounding plug and cable-sealing assembly for connection at pump.
- 9. Control: Float switch.
- 10. Pump Discharge Piping: Factory or field fabricated, **[galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings]**<Insert pipe material>.
- 11. Basin: Watertight plastic with inlet pipe connection and gastight cover with vent and pump discharge connections.

C. Capacities and Characteristics:

- 1. Pump Capacity: <Insert value> **gpm (L/min.)**.
- 2. Total Dynamic Head: <Insert value> **feet (kPa)**.
- 3. Speed: <Insert rpm>.
- 4. Discharge Pipe Size: <Insert value> **NPS (DN)**.
- 5. Motor Horsepower: <Insert value> **hp**.
- 6. Electrical Characteristics:
 - a. Volts: **[120][240]<Insert value> V ac**.
 - b. Phases: **[Single][Three]**.
 - c. Hertz: 60.
- 7. Unit Electrical Characteristics:
 - a. Full-Load Amperes: <Insert value> **A**.
 - b. Minimum Circuit Ampacity: <Insert value> **A**.
 - c. Maximum Overcurrent Protection: <Insert value> **A**.
- 8. Basin:
 - a. Capacity: **[2 gal. (7.6 L)][4 gal. (15.1 L)]<Insert value> minimum**.
 - b. Inlet Connection: **[NPS 1-1/2 (DN 40)]<Insert pipe size> minimum**.
 - c. Vent Connection: **[NPS 1-1/2 (DN 40)]<Insert pipe size> minimum**.

2.10 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation and filling are specified in Section 312000 "Earth Moving."

3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

3.3 INSTALLATION

- A. Pump Installation Standards:
 1. Comply with HI 1.4 for installation of centrifugal pumps.
 2. Comply with HI 3.1-3.5 for installation of progressing-cavity sewage pumps.
- B. Equipment Mounting:
 1. Install progressing-cavity sewage pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
 3. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
- C. Wiring Method: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.4 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Pumps and controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. **<Insert startup steps>**.

3.7 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.8 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain[**controls and**] pumps.

END OF SECTION 22 13 29 00



Task	Specification	Specification Description
22 13 29 00	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 29 13	22 13 29 00	Sanitary Sewerage Pumps
22 13 29 13	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 29 16	22 13 29 00	Sanitary Sewerage Pumps
22 13 29 16	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 29 33	22 13 29 00	Sanitary Sewerage Pumps
22 13 29 33	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 29 36	22 13 29 00	Sanitary Sewerage Pumps
22 13 29 36	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 33 00	22 13 00 00	Facility Gray-Water Storage Tanks
22 13 36 00	22 13 00 00	Facility Gray-Water Storage Tanks



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SECTION 22 14 00 00 - FACILITY STORM-WATER RETENTION TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel, pressure, storm-water retention tanks.
2. Steel, nonpressure, storm-water retention tanks.
3. Insulated, steel, storm-water retention tanks.
4. Plastic, pressure, storm-water retention tanks.
5. Plastic, nonpressure, storm-water retention tanks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for storm-water retention tanks.

B. Shop Drawings:

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of storm-water retention tanks.
4. **<Insert list of products>**.

C. Delegated-Design Submittal: For storm-water retention tanks.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For facility storm-water retention tanks, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design facility storm-water retention tanks.
- B. Structural Performance: Facility storm-water retention tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of dead and live gravity loads and winds of **[100 mph (161 km/h)]<Insert value>**.
- C. Seismic Performance: Facility storm-water retention tank, including structural reinforcement and foundation, shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7]<Insert requirement>**.
1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[**and the system will be fully operational after the seismic event**]."
- D. Thermal Movements: Storm-water retention tank, including structural reinforcement and foundation, shall allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]<Insert temperature change>**.

2.2 STEEL, PRESSURE, STORM-WATER RETENTION TANKS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
1. **[A. O. Smith Corporation]**
 2. **[Adamson Global Technology]**
 3. **[Aldrich Company, Inc. (The)]**
 4. **[Bradford White Corporation]**
 5. **[Cemline Corporation]**
 6. **[Flo Fab Inc]**
 7. **[Green Boiler Technologies]**
 8. **[GSW Water Heating]**
 9. **[HESCO Bastion Ltd.]**
 10. **[Lochinvar, LLC]**
 11. **[Precision Boilers]**

12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. [A. O. Smith Corporation]
2. [Adamson Global Technology]
3. [Aldrich Company, Inc. (The)]
4. [Bradford White Corporation]
5. [Cemline Corporation]
6. [Flo Fab Inc]
7. [Green Boiler Technologies]
8. [GSW Water Heating]
9. [HESCO Bastion Ltd.]
10. [Lochinvar, LLC]
11. [Precision Boilers]
12. [PVI; A WATTS Brand]
13. [RBI]
14. [RECO USA]
15. [State Industries]
16. [Weben-Jarco, Inc]
17. [Wendland Manufacturing Corp.]
18. [Wessels Company]
19. [Wood, John Co]
20. <Insert manufacturer's name>

C. Description: Steel, [horizontal][vertical], pressure-rated tank with cylindrical sidewalls.

D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.

E. Construction: [ASME code, steel][Steel], constructed with welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.

1. Comply with AWWA D100, "Welded Steel Tanks for Water Storage," and with AWWA M42, "Steel Water-Storage Tanks," for welded-steel, surface-water retention tanks.

F. Manhole: Watertight, for tank more than [36 inches (900 mm)]<Insert dimension> in diameter; same pressure rating as tank.

G. Tappings: Factory-fabricated[stainless] steel, welded to tank[before testing and labeling].

1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.

H. Specialties and Accessories: Include tappings in tank and the following:

1. Pressure relief valve.

2. Pressure gage.
3. Thermometer.
4. Air-charging connection.
5. Gage glass, brass fittings, compression stops, and gage-glass guard.

- I. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank[**before testing and labeling**].
- J. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[**before testing and labeling**].
 1. Lining Material: [Cement][Copper]<Insert material>.
 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- K. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.

2.3 STEEL, NONPRESSURE, STORM-WATER RETENTION TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Adamson Global Technology]
 2. [Highland Tank & Manufacturing Company, Inc.]
 3. [RECO USA]
 4. [Steel Tank and Fabricating Corporation (STAFCO)]
 5. [Wood, John Co]
 6. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Adamson Global Technology]
 2. [Highland Tank & Manufacturing Company, Inc.]
 3. [RECO USA]
 4. [Steel Tank and Fabricating Corporation (STAFCO)]
 5. [Wood, John Co]
 6. <Insert manufacturer's name>
- C. Description: Steel, [horizontal][vertical], nonpressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: Steel, constructed with welded joints.
 1. Comply with AWWA D100, "Welded Steel Tanks for Water Storage," and with AWWA M42, "Steel Water-Storage Tanks," for welded-steel, surface-water retention tanks.
- F. Manhole: Watertight, for tank more than [36 inches (900 mm)]<Insert dimension> in diameter.
- G. Cover for Open Tank: [Plastic][Steel, with lining same as or similar to tank lining and] with shape

that encloses top of tank.

- H. Tappings: Factory-fabricated[**stainless**] steel, welded to tank.
 - 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 - 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- I. Specialties and Accessories: Include tappings in tank and the following:
 - 1. Vacuum relief valve.
 - 2. Free air vent with insect screen.
 - 3. Thermometer.
 - 4. Gage glass, brass fittings, compression stops, and gage-glass guard.
- J. Horizontal Tank Supports: Factory-fabricated steel saddles, welded to tank[**before testing and labeling**].
- K. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[**before testing and labeling**].
 - 1. Lining Material: [Cement][Copper]<Insert material>.
 - 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- L. Exterior Coating: [Galvanized][Manufacturer's standard enamel paint][Primer paint]<Insert coating>.

2.4 INSULATED, STEEL, STORM-WATER RETENTION TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [A. O. Smith Corporation]
 - 2. [GSW Water Heating]
 - 3. [HESCO Bastion Ltd.]
 - 4. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
 - 5. [Lochinvar, LLC]
 - 6. [Precision Boilers]
 - 7. [PVI; A WATTS Brand]
 - 8. [RBI]
 - 9. [State Industries]
 - 10. [Vaughn Thermal Corporation]
 - 11. [Wessels Company]
 - 12. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. [A. O. Smith Corporation]
 - 2. [GSW Water Heating]
 - 3. [HESCO Bastion Ltd.]
 - 4. [Laars Heating Systems Company; a subsidiary of Bradford White Corporation]
 - 5. [Lochinvar, LLC]
 - 6. [Precision Boilers]
 - 7. [PVI; A WATTS Brand]



8. [RBI]
9. [State Industries]
10. [Vaughn Thermal Corporation]
11. [Wessels Company]
12. <Insert manufacturer's name>

- C. Description: Steel, vertical, pressure-rated tank with cylindrical sidewalls.
- D. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
- E. Construction: [ASME code, steel][Steel], constructed with welded joints, for [125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.
 1. Comply with AWWA D100, "Welded Steel Tanks for Water Storage," and with AWWA M42, "Steel Water-Storage Tanks," for welded-steel, surface-water retention tanks.
- F. Manhole: Watertight, for tank more than [36 inches (900 mm)]<Insert dimension> in diameter; same pressure rating as tank.
- G. Tappings: Factory-fabricated[stainless] steel, welded to tank[before testing and labeling].
 1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
- H. Specialties and Accessories: Include tappings in tank and the following:
 1. Pressure relief valve.
 2. Pressure gage.
 3. Thermometer.
 4. Air-charging connection.
 5. Gage glass, brass fittings, compression stops, and gage-glass guard.
- I. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank[before testing and labeling].
 1. Lining Material: [Cement][Copper]<Insert material>.
 2. Coating: [Epoxy resin][Galvanized][Glass][Nickel]<Insert coating>.
- J. Insulation: Factory-installed fiberglass or polyurethane foam; surrounding entire tank except connections and other openings; suitable for tank operating temperature; and complying with ASHRAE/IES 90.1.
- K. Jacket: Steel, with manufacturer's standard finish unless otherwise indicated.

2.5 PLASTIC, PRESSURE, STORM-WATER RETENTION TANKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Pentair, Inc.]
 2. [Tankinetics, Inc]

3. <Insert manufacturer's name>
 - B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [Pentair, Inc.]
 2. [Tankinetics, Inc]
 3. <Insert manufacturer's name>
 - C. Description: Fiberglass-reinforced plastic (FRP), vertical, pressure-rated tank with cylindrical sidewalls.
 - D. Construction: [ASME code, composite FRP][Composite FRP], [contact-molded][or][filament-wound], thermosetting-resin tank for [100-psig (690-kPa)][125-psig (860-kPa)][150-psig (1035-kPa)]<Insert value> working pressure.
 1. Comply with AWWA D120.
 - E. Manhole: Watertight, for tank more than [36 inches (900 mm)]<Insert dimension> in diameter; same pressure rating as tank.
 - F. Tappings: Factory-fabricated, FRP flanged-end nozzle.
 1. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
 2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.
 - G. Specialties and Accessories: Include tappings in tank and the following:
 1. Pressure relief valve.
 2. Pressure gage.
 3. Thermometer.
 - H. Vertical Tank Supports: Factory-fabricated steel legs or FRP skirt attached by FRP brackets to tank sidewall.
- 2.6 PLASTIC, NONPRESSURE, STORM-WATER RETENTION TANKS
- A. FRP Water Retention Tanks:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amprotec, Inc.]
 - b. [Belding Tank Technologies, Inc]
 - c. [L. F. Manufacturing, Inc]
 - d. [Palmer Manufacturing and Tank Company]
 - e. <Insert manufacturer's name>
 2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:



- a. [Amprotec, Inc.]
 - b. [Belding Tank Technologies, Inc]
 - c. [L. F. Manufacturing, Inc]
 - d. [Palmer Manufacturing and Tank Company]
 - e. <Insert manufacturer's name>
3. Description: FRP, vertical, nonpressure-rated water tank.
 4. Construction: [ASTM D3299, filament-wound][or][ASTM D4097, contact-molded] FRP.
 5. Tappings: Factory-fabricated, FRP flanged-end nozzle.
 - a. NPS 2 (DN 50) and Smaller: Include plastic-to-steel transition fitting from tank nozzle flange to ASME B1.20.1, female thread.
 - 1) Exception: Tappings may be threaded FRP coupling integral with nozzle for connections for plastic piping.
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting tank.
 7. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter.
 8. Cover for Open Tank: Plastic, same as or similar to tank material and with shape that encloses top of tank.
 9. Specialties and Accessories: Include tappings in tank and the following:
 - a. Vacuum relief valve.
 - b. Free air vent with insect screen.
 - c. Thermometer.
 - d. Gage glass, brass fittings, compression stops, and gage-glass guard.

B. PE Water Retention Tanks:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amprotec, Inc.]
 - b. [Assmann Corporation of America]
 - c. [Chem-Tainer Industries]
 - d. [Poly Processing Company]
 - e. [Premier Plastics Inc.]
 - f. [Snyder Industries, Inc.]
 - g. [Steel Tank and Fabricating Corporation (STAFCO)]
 - h. [TolPlast Company, Inc.]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Amprotec, Inc.]
 - b. [Assmann Corporation of America]
 - c. [Chem-Tainer Industries]
 - d. [Poly Processing Company]
 - e. [Premier Plastics Inc.]

- f. [Snyder Industries, Inc.]
 - g. [Steel Tank and Fabricating Corporation (STAFCO)]
 - h. [TolPlast Company, Inc.]
 - i. <Insert manufacturer's name>
- 3. Description: PE, vertical, flat-bottom, nonpressure-rated water tank.
 - 4. Construction: ASTM D1998, molded PE.
 - 5. Tappings: Factory-fabricated bulkhead fittings attached to tank.
 - a. NPS 2 (DN 50) and Smaller: With female thread.
 - b. NPS 2-1/2 (DN 65) and Larger: Flanged.
 - 6. Vertical Tank Support: Separate factory-fabricated steel stand capable of supporting entire bottom of tank.
 - 7. Manhole: Watertight, for tank more than [36 inches (915 mm)]<Insert dimension> in diameter.
 - 8. Cover for Open Tank: Plastic, same as or similar to tank material and with shape that encloses top of tank.
 - 9. Specialties and Accessories: Include tappings in tank and the following:
 - a. Vacuum relief valve.
 - b. Free air vent with insect screen.
 - c. Thermometer.
 - d. Gage glass, brass fittings, compression stops, and gage-glass guard.

2.7 PAINT MATERIALS

- A. Paint: Comply with AWWA D102.
- B. Primer: Tank fabricator's standard epoxy-polyamide paint.
- C. Tank Shell Exterior Intermediate Paint: Tank fabricator's standard, two-component epoxy paint compatible with prime and finish paint. Intermediate coat shall have a slight color contrast with finish coat.
- D. Tank Shell Exterior Finish Paint: Tank fabricator's standard urethane paint.
 - 1. Color: [As selected by Owner from tank manufacturer's paint chart]<Insert color>.

2.8 SHOP PAINTING

- A. Tank Shell Exterior Finish Coat: Factory coating according to AWWA D103.

PART 3 - EXECUTION

3.1 INSTALLATION OF STORM-WATER RETENTION TANKS

- A. Install storm-water retention tanks on concrete bases, level and plumb, firmly anchored. Arrange so devices needing servicing are accessible.
 - 1. Install horizontal tanks on [concrete piers and factory-fabricated][fabricated steel supports and] saddles.

- B. Anchor tank supports and tanks to substrate.
 - 1. Use steel or FRP straps over or around plastic tanks.
- C. Install thermometers and pressure gages on water retention tanks and piping if indicated. Thermometers and pressure gages are specified in Section 220500 "Common Work Results for Plumbing."
- D. Install the following devices on tanks where indicated:
 - 1. Pressure relief valves.
 - 2. Temperature and pressure relief valves.
 - 3. Vacuum relief valves.
 - 4. Tank vents on nonpressure tanks.
 - 5. Connections to accessories.
- E. After installing tanks with factory finish, inspect finishes and repair damages to finishes.

3.2 CONNECTIONS

- A. Where installing piping adjacent to storm-water retention tanks, allow space for service and maintenance.
- B. Connect water piping to water retention tanks with unions or flanges and with shutoff valves. Connect tank drains with shutoff valves and discharge over closest floor drains.
 - 1. Valves NPS 2 (DN 50) and Smaller: Gate valves or ball valves complying with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."
 - 2. Valves NPS 2-1/2 (DN 65) and Larger: Gate valves or butterfly valves complying with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."
 - 3. Drain Valves: **NPS 3/4 (DN 20)** gate valves or ball valves complying with requirements in Section 220523 "General-Duty Valves for Plumbing Piping." Include outlet with, or nipple in outlet with, ASME B1.20.7, 3/4-11.5NH thread for garden-hose service, threaded cap, and chain.
 - 4. Water Piping Connections: Make connections to dissimilar metals with dielectric fittings. Dielectric fittings are specified in Section 221116 "Domestic Water Piping."

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

END OF SECTION 22 14 00 00



Task	Specification	Specification Description
22 14 13 00	22 11 16 00a	Storm Drainage Piping
22 14 13 00	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 26 00	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 26 13	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 26 16	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 26 19	22 14 00 00	Facility Storm-Water Retention Tanks



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SECTION 22 14 29 00 - SUMP PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sump pumps - submersible.
2. Sump pumps - wet-pit volute.
3. Oil-sensing sump pumps and controllers.
4. Sump pumps - pedestal.
5. Sump-pump basins and basin covers.
6. Packaged drainage-pump units - submersible.

B. Related Requirements:

1. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Sump pumps - submersible.
2. Sump pumps - wet-pit volute.
3. Oil-sensing sump pumps and controllers.
4. Sump pumps - pedestal.
5. Sump-pump basins and basin covers.
6. Packaged drainage-pump units - submersible.

B. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, and **[mounting][attachment]** details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls.

1. Indicate actual installed items by marking submittals with an arrow or box.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with manufacturer's written instructions for handling.

1.5 WARRANTY

- A. Manufacturer Warranty: **[Manufacturer agrees][Installer agrees][Manufacturer and Installer agree]** to repair or replace sump pumps that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of **<Insert components>**.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal **[weathering][use]**.
 - c. **<Insert conditions relating to specified products>**.
 - d. **<Insert failure modes>**.
 - 2. Warranty Period: **[1]<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of sump pump from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.3 SUMP PUMPS - SUBMERSIBLE

- A. Sump Pumps - Submersible, Fixed Position, Single Seal: .
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Crane Pumps & Systems]**
 - c. **[Glentronics, Inc.]**
 - d. **[GRUNDFOS CBS Inc.]**

- e. [Industrial Flow Solutions]
 - f. [Liberty Pumps]
 - g. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - h. [Pentair Aurora; Pentair Pump Group]
 - i. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - j. [Weil Pump; a Wilo Company]
 - k. [Xylem]
 - l. [Zoeller Company]
 - m. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [Crane Pumps & Systems]
 - c. [Glentronics, Inc.]
 - d. [GRUNDFOS CBS Inc.]
 - e. [Industrial Flow Solutions]
 - f. [Liberty Pumps]
 - g. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - h. [Pentair Aurora; Pentair Pump Group]
 - i. [ProFlo; a Ferguson Enterprises, Inc. brand]
 - j. [Weil Pump; a Wilo Company]
 - k. [Xylem]
 - l. [Zoeller Company]
 - m. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested sump-pump unit.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 14.1-14.2 and HI 14.3.
5. Pump Casing: Cast iron, with strainer inlet; legs that elevate pump to permit flow into impeller; and vertical discharge for piping connection.
6. Impeller: Statically and dynamically balanced, [manufacturer's standard]<Insert material> designed for clear wastewater handling, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel[or steel], with factory-sealed, grease-lubricated ball bearings.
8. Seal: Mechanical.
9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: [Air][Oil].
10. Capacities and Characteristics:
 - a. Unit Capacity: <Insert gpm (L/min.)>.
 - b. Number of Pumps: [One][Two]<Insert number>.
 - c. Each Pump:
 - 1) Capacity: <Insert gpm (L/min.)>.
 - 2) Total Dynamic Head: <Insert feet (kPa)>.
 - 3) Speed: <Insert rpm>.
 - 4) Discharge Size: <Insert NPS (DN)>.
 - 5) Electrical Characteristics:

- a) Motor Horsepower: <Insert value> hp.
 - b) Volts: [115][230][460]<Insert value> V ac.
 - c) Phases: [Single][Three].
 - d) Hertz: 60.
 - d. Unit Electrical Characteristics:
 - 1) Full-Load Amperes: <Insert value> A.
 - 2) Minimum Circuit Ampacity: <Insert value> A.
 - 3) Maximum Overcurrent Protection: <Insert value> A.
 11. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 12. Controls, Float- and Pressure-Switch Type:
 - a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
 - b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 13. Control-Interface Features:
 - a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.
- B. Sump Pumps - Submersible, Fixed Position, Double Seal: .
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [EBARA Pumps Americas Corp.]
 - b. [GRUNDFOS CBS Inc.]
 - c. [Industrial Flow Solutions]
 - d. [Xylem]
 - e. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[EBARA Pumps Americas Corp.]**
 - b. **[GRUNDFOS CBS Inc.]**
 - c. **[Industrial Flow Solutions]**
 - d. **[Xylem]**
 - e. **<Insert manufacturer's name>**
3. Description: Factory-assembled and -tested sump-pump unit.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 14.1-14.2 and HI 14.3.
5. Pump Casing: Cast iron, with strainer inlet; legs that elevate pump to permit flow into impeller; and vertical discharge for piping connection.
6. Impeller: Statically and dynamically balanced, **[manufacturer's standard]<Insert material>** designed for clear wastewater handling, and keyed and secured to shaft.
7. Pump and Motor Shaft: Stainless steel **[or steel]**, with factory-sealed, grease-lubricated ball bearings.
8. Seals: Mechanical.
9. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
10. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: **[Air][Oil]**.
11. Capacities and Characteristics:
 - a. Unit Capacity: **<Insert gpm (L/min.)>**.
 - b. Number of Pumps: **[One][Two]<Insert number>**.
 - c. Each Pump:
 - 1) Capacity: **<Insert gpm (L/min.)>**.
 - 2) Total Dynamic Head: **<Insert feet (kPa)>**.
 - 3) Speed: **<Insert rpm>**.
 - 4) Discharge Size: **<Insert NPS (DN)>**.
 - 5) Electrical Characteristics:
 - a) Motor Horsepower: **<Insert value> hp**.
 - b) Volts: **[115][230][460]<Insert value> V ac**.
 - c) Phases: **[Single][Three]**.
 - d) Hertz: 60.
 - d. Unit Electrical Characteristics:
 - 1) Full-Load Amperes: **<Insert value> A**.
 - 2) Minimum Circuit Ampacity: **<Insert value> A**.
 - 3) Maximum Overcurrent Protection: **<Insert value> A**.
12. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.

- d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
13. Controls, Float- and Pressure-Switch Type:
- a. Enclosure: NEMA 250, **[Type 1][Type 4X]<Insert type>**; **[pedestal][wall]** mounted.
 - b. Switch Type: **[Mechanical-float][Mercury-float][Pressure]<Insert type>** type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with **[mechanical-float, mercury-float, or pressure]<Insert type>** switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
14. Control-Interface Features:
- a. Remote Alarm Contacts: For remote alarm interface.
 - b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

2.4 SUMP PUMPS - WET-PIT VOLUTE

A. Sump Pumps - Wet-Pit Volute: .

- 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Crane Pumps & Systems]**
 - b. **[Federal Pump Corp]**
 - c. **[Peerless Pump Company]**
 - d. **[Swaby Manufacturing Company]**
 - e. **[Tramco Pump Company]**
 - f. **[Vertiflo Pump Company]**
 - g. **[Weil Pump; a Wilo Company]**
 - h. **<Insert manufacturer's name>**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Crane Pumps & Systems]**
 - b. **[Federal Pump Corp]**
 - c. **[Peerless Pump Company]**
 - d. **[Swaby Manufacturing Company]**
 - e. **[Tramco Pump Company]**
 - f. **[Vertiflo Pump Company]**
 - g. **[Weil Pump; a Wilo Company]**

- h. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested sump-pump unit.
 4. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller, centrifugal sump pump as defined in HI 14.1-14.2 and HI 14.3.
 5. Pump Casing: Cast iron, with strainer inlet and threaded connection for **NPS 2 (DN 50)** and smaller and flanged connection for **NPS 2-1/2 (DN 65)** and larger discharge piping.
 6. Impeller: Statically and dynamically balanced, [**manufacturer's standard**]<Insert material> designed for clear wastewater handling, and keyed and secured to shaft.
 7. Sleeve Bearings: Bronze. Include oil-lubricated, intermediate sleeve bearings at **48-inch- (1200-mm-)** maximum intervals if basin depth is more than **48 inches (1200 mm)**, and grease-lubricated, ball-type thrust bearings.
 8. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
 9. Pump Discharge Piping: Factory- or field-fabricated, [**galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.1, Class 125, cast-iron flanges and flanged fittings or ASME B16.4, Class 125, gray-iron threaded fittings**]<Insert pipe material>.
 10. Support Plate: Cast iron or coated steel; strong enough to support pumps, motors, and controls. See "Sump-Pump Basins and Basin Covers" Article for requirements.
 11. Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.
 12. Motor: Single speed; grease-lubricated ball bearings and mounting on vertical, cast-iron pedestal.
 13. Capacities and Characteristics:
 - a. Unit Capacity: <Insert gpm (L/min.)>.
 - b. Number of Pumps: [**One**][**Two**]<Insert number>.
 - c. Each Pump:
 - 1) Capacity: <Insert gpm (L/min.)>.
 - 2) Total Dynamic Head: <Insert feet (kPa)>.
 - 3) Speed: <Insert rpm>.
 - 4) Discharge Size: <Insert NPS (DN)>.
 - 5) Electrical Characteristics:
 - a) Motor Horsepower: <Insert value> hp.
 - b) Volts: [**115**][**230**][**460**]<Insert value> V ac.
 - c) Phases: [**Single**][**Three**].
 - d) Hertz: 60.
 - d. Unit Electrical Characteristics:
 - 1) Full-Load Amperes: <Insert value> A.
 - 2) Minimum Circuit Ampacity: <Insert value> A.
 - 3) Maximum Overcurrent Protection: <Insert value> A.
 14. Controls, Rod-and-Float Type:
 - a. Enclosure: NEMA 250, [**Type 1**][**Type 4X**]<Insert type>.
 - b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
 - c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
 - d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than **60 inches (1500 mm)**.
 - e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
 15. Controls, Float- and Pressure-Switch Type:

- a. Enclosure: NEMA 250, [Type 1][Type 4X]<Insert type>; [pedestal][wall] mounted.
- b. Switch Type: [Mechanical-float][Mercury-float][Pressure]<Insert type> type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
- c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
- d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with [mechanical-float, mercury-float, or pressure]<Insert type> switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

16. Control-Interface Features:

- a. Remote Alarm Contacts: For remote alarm interface.
- b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

2.5 OIL-SENSING SUMP PUMPS AND CONTROLLERS

A. Oil-Sensing Sump Pumps and Controllers: .

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Flo Fab Inc]
 - b. [Industrial Flow Solutions]
 - c. [Liberty Pumps]
 - d. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - e. [Weil Pump; a Wilo Company]
 - f. [Xylem]
 - g. [Zoeller Company]
 - h. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Flo Fab Inc]
 - b. [Industrial Flow Solutions]
 - c. [Liberty Pumps]
 - d. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - e. [Weil Pump; a Wilo Company]
 - f. [Xylem]
 - g. [Zoeller Company]
 - h. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested sump-pump unit. ASME A17.1 compliant.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 14.1-14.2 and HI 14.3.
5. Pump Casing: Cast iron, with strainer inlet; legs that elevate pump to permit flow into impeller; and vertical discharge for piping connection.

6. Capacities and Characteristic:

- a. Unit Capacity: **<Insert gpm (L/min.)>**.
- b. Number of Pumps: **[One][Two]<Insert number>**.
- c. Each Pump:
 - 1) Capacity: **<Insert gpm (L/min.)>**.
 - 2) Total Dynamic Head: **<Insert feet (kPa)>**.
 - 3) Speed: **<Insert rpm>**.
 - 4) Discharge Size: **<Insert NPS (DN)>**.
 - 5) Electrical Characteristics:
 - a) Motor Horsepower: **<Insert value> hp**.
 - b) Volts: **[115][230][460]<Insert value> V ac**.
 - c) Phases: **[Single][Three]**.
 - d) Hertz: 60.
- d. Unit Electrical Characteristics:
 - 1) Full-Load Amperes: **<Insert value> A**.
 - 2) Minimum Circuit Ampacity: **<Insert value> A**.
 - 3) Maximum Overcurrent Protection: **<Insert value> A**.

7. Controls:

- a. Industrial-grade switch(es) with internal **[20]<Insert number> A** relay and Type 304 stainless steel sensor probes.
- b. Liquid/oil sensor that differentiates and indicates the presence of oil and/or water under high-water conditions.
- c. Alarm Panel:
 - 1) High-oil-level alarm.
 - 2) High-water-level alarm.
 - 3) Audible and visual alarms for each alarm condition.
 - 4) Dry contacts for remote monitoring of oil, water, and high liquid conditions.
- d. Control Panel:
 - 1) **[Simplex][Duplex]**.
 - 2) Enclosure: NEMA 250, Type 4X.
 - 3) HOA switch(es).
 - 4) Green pump run light; power on light.
 - 5) Pump circuit breaker(s).

2.6 SUMP PUMPS - PEDESTAL

A. Sump Pumps - Pedestal: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[AMT; a Gorman-Rupp company]**

- c. [Federal Pump Corp]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - f. [Pentair Aurora; Pentair Pump Group]
 - g. [Tramco Pump Company]
 - h. [Zoeller Company]
 - i. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [A.Y. McDonald Mfg. Co.]
 - b. [AMT; a Gorman-Rupp company]
 - c. [Federal Pump Corp]
 - d. [Goulds Water Technology; a Xylem brand]
 - e. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - f. [Pentair Aurora; Pentair Pump Group]
 - g. [Tramco Pump Company]
 - h. [Zoeller Company]
 - i. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested, automatic-operation, freestanding, sump-pump unit.
4. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller centrifugal sump pump, configured as a pedestal pump. Sump pump to be as defined in HI 14.1-14.2 and HI 14.3.
5. Pump Casing: Corrosion-resistant material, with strainer inlet; design that permits flow into impeller; and vertical discharge for piping connection.
6. Impeller: Aluminum, brass, or plastic.
7. Motor: With built-in overload protection and mounted vertically on sump-pump column.
8. Power Cord: Three-conductor waterproof cable of length required, but not less than **72 inches (1830 mm)**, with grounding plug and cable-sealing assembly for connection at pump.
9. Capacities and Characteristics:
 - a. Capacity: <Insert gpm (L/min.)>.
 - b. Total Dynamic Head: <Insert feet (kPa)>.
 - c. Speed: <Insert rpm>.
 - d. Discharge Size: <Insert NPS (DN)>.
 - e. Electrical Characteristics:
 - 1) Motor Horsepower: <Insert value> hp.
 - 2) Volts: [115][230][460]<Insert value> V ac.
 - 3) Phases: [Single][Three].
 - 4) Hertz: 60.
10. Control: Float switch.

2.7 SUMP-PUMP BASINS AND BASIN COVERS

- A. Basins : Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.
 1. Material: [Cast iron][Fiberglass][Polyethylene]<Insert material>.
 2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
 3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump,

and in location and of size required to anchor basin in concrete slab.

- B. Basin Covers: Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

- C. Capacities and Characteristics:

1. Capacity: **<Insert gal. (L)>**.
2. Diameter: **<Insert inches (mm)>**.
3. Depth: **<Insert inches (mm)>**.
4. Inlet No. 1:
 - a. Drainage Pipe Size: **<Insert NPS (DN)>**.
 - b. Bottom of Sump to Centerline: **<Insert inches (mm)>**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
5. Inlet No. 2:
 - a. Drainage Pipe Size: **<Insert NPS (DN)>**.
 - b. Bottom of Sump to Centerline: **<Insert inches (mm)>**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
6. Inlet No. 3:
 - a. Drainage Pipe Size: **<Insert NPS (DN)>**.
 - b. Bottom of Sump to Centerline: **<Insert inches (mm)>**.
 - c. Type: **[Flanged][Hubbed][Threaded]** outside.
7. Sidewall Outlet:
 - a. Discharge Pipe Size: **<Insert NPS (DN)>**.
 - b. Bottom of Sump to Centerline: **<Insert inches (mm)>**.
 - c. Type: **[Hubbed inside][Hubbed outside]<Insert type>**.
8. Cover Material: **[Cast iron][Steel with bituminous coating][Cast iron or steel with bituminous coating]<Insert material>**.
9. Cover Diameter: **<Insert inches (mm)>**, but not less than OD of basin top flange.
10. Manhole Required in Cover: **[Yes][No]**.
11. Vent Size: **<Insert NPS (DN)>**.

2.8 PACKAGED DRAINAGE-PUMP UNITS - SUBMERSIBLE

- A. Packaged Drainage-Pump Units - Submersible: .

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Liberty Pumps]**

- c. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - d. [Pentair Aurora; Pentair Pump Group]
 - e. [Zoeller Company]
 - f. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
- a. [A.Y. McDonald Mfg. Co.]
 - b. [Liberty Pumps]
 - c. [Little Giant; a brand of Franklin Electric Co., Inc.]
 - d. [Pentair Aurora; Pentair Pump Group]
 - e. [Zoeller Company]
 - f. <Insert manufacturer's name>
3. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, sump-pump unit.
4. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller centrifugal pump as defined in HI 14.1-14.2 and HI 14.3.
5. Casing: [Metal]<Insert material>.
6. Impeller: [Brass]<Insert material>.
7. Pump Seal: Mechanical.
8. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection.
9. Power Cord: Three-conductor waterproof cable of length required, but not less than **72 inches (1830 mm)**, with grounding plug and cable-sealing assembly for connection at pump.
10. Pump Discharge Piping: Factory- or field-fabricated, [galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings]<Insert pipe material>.
11. Control: Motor-mounted float switch.
12. Basin: Plastic.
13. Capacities and Characteristics:
- a. Capacity: <Insert gpm (L/min.)>.
 - b. Total Dynamic Head: <Insert feet (kPa)>.
 - c. Speed: <Insert rpm>.
 - d. Discharge Pipe Size: <Insert NPS (DN)>.
 - e. Electrical Characteristics:
 - 1) Motor Horsepower: <Insert value> hp.
 - 2) Volts: [115][230][460]<Insert value> V.
 - 3) Phases: [Single][Three].
 - 4) Hertz: 60.
 - 5) Full-Load Amperes: <Insert value> A.
 - 6) Minimum Circuit Ampacity: <Insert value> A.
 - 7) Maximum Overcurrent Protection: <Insert value> A.
 - f. Basin:
 - 1) Capacity: [2 gal. (7.6 L)][5 gal. (18.9 L)]<Insert value> minimum.
 - 2) Inlet Connection: [NPS 1-1/2 (DN 40)]<Insert pipe size> minimum.

2.9 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Motors for submersible pumps are to be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation and filling are specified in Section 312000 "Earth Moving."

3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump-pump installation.

3.3 INSTALLATION

- A. Pump Installation Standards: Comply with HI 14.4 for installation of sump pumps.
- B. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
 - 2. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
- C. Wiring Method: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.4 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.5 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform][Perform]** startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. **<Insert startup steps if any>.**

3.6 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage][Engage]** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.
- C. Tests and inspections:
 1. Perform each visual and mechanical inspection.
 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 5. Pumps and controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train][Train]** Owner's maintenance personnel to adjust, operate, and maintain **[controls and]** pumps.

END OF SECTION 22 14 29 00



Task	Specification	Specification Description
22 14 29 00	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 29 13	22 14 29 00	Sump Pumps
22 14 29 13	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 29 16	22 13 29 00	Sanitary Sewerage Pumps
22 14 29 16	22 14 29 00	Sump Pumps
22 14 29 16	22 14 00 00	Facility Storm-Water Retention Tanks
22 14 29 19	22 14 29 00	Sump Pumps
22 14 29 19	22 14 00 00	Facility Storm-Water Retention Tanks



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SECTION 22 15 13 00 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Piping and related specialties for general-service compressed-air systems, as follows:
 - 1. Pipes, tubes, and fittings.
 - 2. Joining materials.
 - 3. Valves.
 - 4. Dielectric fittings.
 - 5. Flexible pipe connectors.
 - 6. Specialties.
 - 7. Quick couplings.
 - 8. Hose assemblies.
- B. Related Requirements:
 - 1. Section 221519 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.2 DEFINITIONS

- A. CR: Chlorosulfonated polyethylene synthetic rubber.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. HDPE: High-density polyethylene plastic.
- D. High-Pressure, Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between **150 and 200 psig (1035 and 1380 kPa)**.
- E. Low-Pressure, Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of **150 psig (1035 kPa)** or less.
- F. NBR: Nitrile butadiene rubber.
- G. PE: Polyethylene plastic.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Plastic pipes, fittings, and valves.
 - 2. Dielectric fittings.
 - 3. Flexible pipe connectors.
 - 4. Safety valves.
 - 5. Pressure regulators. Include rated capacities and operating characteristics.
 - 6. Automatic drain valves.

7. Filters. Include rated capacities and operating characteristics.
8. Lubricators. Include rated capacities and operating characteristics.
9. Quick couplings.
10. Hose assemblies.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates:
 1. **[Brazing][and][welding]** certificates.
- B. Field quality-control reports.
- C. Qualification Statements: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by respective manufacturer, for making branch outlets.
 2. Press-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by respective manufacturer.
 3. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by respective manufacturer.
 4. Joining Procedures for Aluminum Piping Systems: Qualify installers according to training provided by respective manufacturer.
- B. Brazing: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or with AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."
- C. Welding: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code: Section IX.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Compressed-Air Service: Do not interrupt compressed-air service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary compressed-air service according to requirements indicated:
 1. Notify **[Architect][Construction Manager][Owner]** no fewer than **[two]<Insert number>** days in advance of proposed interruption of compressed-air service.
 2. Do not proceed with interruption of compressed-air service without **[Architect's][Construction Manager's][Owner's]** written permission.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each product type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Compressed-air piping system to withstand the effects of earthquake motions determined in accordance with **[ASCE/SEI 7]<Insert requirement>**. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
1. The term "withstand" means "the piping system will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the piping system will be fully operational after the seismic event**]."
 2. Component Importance Factor: **[1.5][1.0]**.
 3. **<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.
- B. ASME Compliance:
1. Comply with ASME B31.1, "Power Piping," for high-pressure, compressed-air piping.
 2. Comply with ASME B31.3, "Process Piping," for high- and low-pressure, compressed-air piping.
 3. Comply with ASME B31.9, "Building Services Piping," for low-pressure, compressed-air piping.

2.3 PIPES, TUBES, AND FITTINGS

- A. Schedule 40, Steel Pipe: ASTM A53/A53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded in accordance with ASME B1.20.1.
1. Steel Nipples: ASTM A733, made of ASTM A53/A53M or ASTM A106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
 2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
 3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
 4. Steel Flanges, Threaded: ASME B16.5, Class 150 or 300, carbon steel, threaded.
 5. Wrought-Steel, Butt-Welding Fittings: ASME B16.9, Schedule 40.
 6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
 7. Grooved-End Fittings and Couplings, Steel:
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) **[Anvil; an ASC Engineered Solution]**
 - 2) **[ASC Engineered Solutions]**
 - 3) **[Star Pipe Products]**
 - 4) **[Victaulic Company]**
 - 5) **[Ward Manufacturing LLC]**
 - 6) **<Insert manufacturer's name>**
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of

the following:

- 1) [Anvil; an ASC Engineered Solution]
- 2) [ASC Engineered Solutions]
- 3) [Star Pipe Products]
- 4) [Victaulic Company]
- 5) [Ward Manufacturing LLC]
- 6) <Insert manufacturer's name>

- c. Grooved-End Fittings: ASTM A47/A47M, malleable-iron castings or ASTM A536, ductile-iron castings; with grooves in accordance with AWWA C606 and dimensions matching steel pipe.
- d. Grooved-End Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for **300 psig (2070 kPa)** minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oil-free compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.

B. Schedule 5, Steel Pipe: ASTM A135, carbon steel with plain ends and zinc-plated finish.

1. Press-Type, Schedule 5 Steel, Fittings: Listed and labeled by qualified testing agency and FM Global-approved, carbon-steel, pressure-seal housing with O-ring end seals suitable for compressed-air piping and rated for **300 psig (2070 kPa)** minimum working pressure. Provide EDPM seals for oil-free compressed air. Provide NBR seals if compressed air contains oil or oil vapor.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) [Anvil; an ASC Engineered Solution]
 - 2) [Victaulic Company]
 - 3) [Viega LLC]
 - 4) <Insert manufacturer's name>
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - 1) [Anvil; an ASC Engineered Solution]
 - 2) [Victaulic Company]
 - 3) [Viega LLC]
 - 4) <Insert manufacturer's name>

C. Copper Tube: [ASTM B88, Type K or L (ASTM B88M, Type A or B)] seamless, drawn-temper, water tube.

1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
3. Copper Unions: ASME B16.22 or MSS SP-123.
4. Press-Type, Copper Tube, Fittings, **NPS 2 (DN 50)** and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
 - a. Manufacturers: Subject to compliance with requirements, **[provide products by the**

following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- 2) [NIBCO INC.]
- 3) [Viega LLC]
- 4) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [Apollo Valves; a part of Aalberts Integrated Piping Systems]
- 2) [NIBCO INC.]
- 3) [Viega LLC]
- 4) <Insert manufacturer's name>

5. Press-Type, Copper Tube, Fittings, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Bronze fitting with stainless steel grip ring and EPDM O-ring seal in each end.

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [NIBCO INC.]
- 2) [Viega LLC]
- 3) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [NIBCO INC.]
- 2) [Viega LLC]
- 3) <Insert manufacturer's name>

6. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube in accordance with ASTM F2014.

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [T-DRILL Industries Inc]
- 2) <Insert manufacturer's name>

- b. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- 1) [T-DRILL Industries Inc]
- 2) <Insert manufacturer's name>



7. Grooved-End Fittings and Couplings, Copper:

- a. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- 1) **[Anvil; an ASC Engineered Solution]**
- 2) **[ASC Engineered Solutions]**
- 3) **[Victaulic Company]**
- 4) **<Insert manufacturer's name>**

- b. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- 1) **[Anvil; an ASC Engineered Solution]**
- 2) **[ASC Engineered Solutions]**
- 3) **[Victaulic Company]**
- 4) **<Insert manufacturer's name>**

- c. Grooved-End Fittings: ASTM B75/B75M, copper tube or ASTM B584, bronze castings.
- d. Grooved-End Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gasket for oil-free compressed air. Provide NBR gasket if compressed air contains oil or oil vapor.

- D. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

- E. Aluminum Piping System: Aluminum pipe, Alloy Grade AA 6035-T5, for push-connect bite ring couplings, and roll-groove couplings.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. **[Applied System Technologies]**
- b. **[Gardner Denver, an Ingersoll Rand business]**
- c. **[Ingersoll Rand]**
- d. **[SynergAir]**
- e. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. **[Applied System Technologies]**
- b. **[Gardner Denver, an Ingersoll Rand business]**
- c. **[Ingersoll Rand]**
- d. **[SynergAir]**
- e. **<Insert manufacturer's name>**

3. Pressure and Temperature Range: Aluminum piping and related specialties for general-service

- compressed-air systems operating at **220 psig (1517 kPa)** or less, across a temperature range of **minus 4 to plus 176 deg F (minus 20 to plus 80 deg C)**.
4. Tubing, 14 to 273 mm: Aluminum pipe, Alloy Grade AA 6063-T5.
 5. Pipe Coating: Powder-coated paint that is certified nontoxic to AAMA 603 and AAMA 605, blue for compressed air.
 6. Provide tubing that is quality controlled to comply with tolerances specified by roll-groove or push-to-connect coupling manufacturer. Tubing manufacturer follows ISO 9001:2000 quality standards.
 7. Pipe Identification: Decal with maximum working pressure and temperature on each length of pipe.
 8. Push-Connect Bite Ring Couplings, 14 to 63 mm: Solid-brass and nickel-plated body, NBR O-ring seal in excess of 36 percent, and AISI Type 304 stainless steel clamping washer.
 9. Fittings: Solid brass and nickel plated.
 10. Roll-Groove Couplings, 73 to 273 mm: Solid ductile-iron, galvanized, ASTM A536 Grade 65-45-12, NBR standard seals, and fluoroelastomer seals for high-temperature applications.
 11. Ball Valves, 20 to 63 mm: NPT ends, or push-connect bite ring ends.
 12. Butterfly Valves, 73 to 273 mm: Tube to tube, with two roll-groove end couplings.
 13. Flanges, 73 to 273 mm: ASME B16.5, Class 150.
- F. Blue ABS Piping System: Made of ASTM D3965, ABS-resin modified to provide shatter-resistant pipe for compressed-air service. Pipe and fittings are light blue and sizes are in millimeters.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[IPEX USA LLC]**
 - b. **<Insert manufacturer's name>**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[IPEX USA LLC]**
 - b. **<Insert manufacturer's name>**
 3. Transition Fittings, 20 to 63 mm: Composite union with ABS socket end, CR O-ring, and malleable-iron union nut and threaded end; with construction similar to MSS SP-107, transition union.
 4. Transition Fittings, 90 to 110 mm: Flange assembly with ABS flange, CR gasket, and metal flange of material matching piping to be connected.
 5. Valves, 20 to 63 mm: ABS union ball valve with socket ends.
 6. Valves, 90 to 110 mm: ABS butterfly valve with lever handle.
- G. Green ABS Piping System: Made of ASTM D3965, ABS-resin modified to provide shatter-resistant pipe for compressed-air service. Pipe and fittings are dark green with SDR of 9.0 and same OD as ASTM A53/A53M, steel pipe.
1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[NIBCO INC.]**
 - b. **<Insert manufacturer's name>**

2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[NIBCO INC.]**
 - b. **<Insert manufacturer's name>**
3. Transition Fittings, **NPS 1/2 to NPS 2 (DN 15 to DN 50)**: Composite union with ABS socket end, CR O-ring, ABS union nut, and brass solder-joint end; with construction similar to MSS SP-107, transition union.
4. Transition Fittings, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: ABS flange, CR gasket, and metal flange of material matching piping to be connected.
5. Valves, **NPS 1/2 to NPS 2 (DN 15 to DN 50)**: Union ball valve with socket ends.
6. Valves, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Union ball valve with flanged ends. Include safety exhaust feature in "Valve Applications" Article if required.

H. HDPE Piping System: Made of ASTM D1248, HDPE resin to provide shatter-resistant pipe for compressed-air service. Pipe and fittings are dark blue with pipe dimensions about the same OD as ASTM D3035, PE pipe.

1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
 - a. **[Asahi/America]**
 - b. **<Insert manufacturer's name>**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[Asahi/America]**
 - b. **<Insert manufacturer's name>**
3. Transition Fittings, **NPS 1/2 to NPS 2 (DN 15 to DN 50)**: HDPE adapter with one socket end and one end with threaded brass insert.
4. Transition Fittings, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: HDPE flange, CR gasket, and metal flange of material matching piping to be connected.
5. Valves, **NPS 1/2 to NPS 3 (DN 15 to DN 80)**: HDPE union ball valve with socket ends.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system

manufacturer unless otherwise indicated.

- D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux in accordance with ASTM B813.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D2235.

2.5 VALVES

- A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Capitol Manufacturing Company]**
 - c. **[GF Piping Systems: Georg Fischer LLC]**
 - d. **[HART Industrial Unions, LLC]**
 - e. **[Jomar Valve]**
 - f. **[Matco-Norca]**
 - g. **[Viega LLC]**
 - h. **[WATTS; A Watts Water Technologies Company]**
 - i. **[Wilkins]**
 - j. **<Insert manufacturer's name>**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. **[A.Y. McDonald Mfg. Co.]**
 - b. **[Capitol Manufacturing Company]**
 - c. **[GF Piping Systems: Georg Fischer LLC]**
 - d. **[HART Industrial Unions, LLC]**
 - e. **[Jomar Valve]**
 - f. **[Matco-Norca]**
 - g. **[Viega LLC]**

- h. [WATTS; A Watts Water Technologies Company]
- i. [Wilkins]
- j. <Insert manufacturer's name>

3. Description:

- a. Standard: ASSE 1079.
- b. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][250 psig (1725 kPa)].
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Capitol Manufacturing Company]
- b. [GF Piping Systems: Georg Fischer LLC]
- c. [Matco-Norca]
- d. [Viega LLC]
- e. [WATTS; A Watts Water Technologies Company]
- f. [Wilkins]
- g. <Insert manufacturer's name>

2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. [Capitol Manufacturing Company]
- b. [GF Piping Systems: Georg Fischer LLC]
- c. [Matco-Norca]
- d. [Viega LLC]
- e. [WATTS; A Watts Water Technologies Company]
- f. [Wilkins]
- g. <Insert manufacturer's name>

3. Description:

- a. Standard: ASSE 1079.
- b. Factory-fabricated, bolted, companion-flange assembly.
- c. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)][150 psig (1035 kPa)][175 psig (1200 kPa)][300 psig (2070 kPa)].
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Advance Products & Systems, LLC]

- b. [CALPICO, Inc.]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [GPT; a division of EnPRO Industries]
 - e. <Insert manufacturer's name>
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. [Advance Products & Systems, LLC]
 - b. [CALPICO, Inc.]
 - c. [GF Piping Systems: Georg Fischer LLC]
 - d. [GPT; a division of EnPRO Industries]
 - e. <Insert manufacturer's name>
3. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: [150 psig (1035 kPa)]<Insert pressure>.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

2.7 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [ASC Engineered Solutions]
 2. [Flex-Hose Co., Inc]
 3. [Flexicraft Industries]
 4. [Hyspan Precision Products, Inc]
 5. [Kadant Unaflex, LLC]
 6. [Mercer Rubber Co]
 7. [Metraflex Company (The)]
 8. [Proco Products, Inc]
 9. [Universal Metal Hose]
 10. <Insert manufacturer's name>
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 1. [ASC Engineered Solutions]
 2. [Flex-Hose Co., Inc]
 3. [Flexicraft Industries]
 4. [Hyspan Precision Products, Inc]
 5. [Kadant Unaflex, LLC]
 6. [Mercer Rubber Co]
 7. [Metraflex Company (The)]
 8. [Proco Products, Inc]
 9. [Universal Metal Hose]
 10. <Insert manufacturer's name>
- C. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and

ends brazed to inner tubing.

1. Working-Pressure Rating: **[200 psig (1380 kPa)][250 psig (1725 kPa)]** minimum.
2. End Connections, **NPS 2 (DN 50)** and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, **NPS 2-1/2 (DN 65)** and Larger: Flanged copper alloy.

- D. Stainless Steel-Hose Flexible Pipe Connectors: Corrugated, stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: **[200 psig (1380 kPa)][250 psig (1725 kPa)]** minimum.
2. End Connections, **NPS 2 (DN 50)** and Smaller: Threaded steel pipe nipple.
3. End Connections, **NPS 2-1/2 (DN 65)** and Larger: Flanged steel nipple.

2.8 SPECIALTIES

- A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

- B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for **[250 psig (1725 kPa)]<Insert pressure>** inlet pressure, unless otherwise indicated.

1. Type: Pilot operated.

- C. Air-Line Pressure Regulators, Bronze Body: **[Diaphragm][or][pilot]** operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for **[200 psig (1380 kPa)]<Insert pressure>** minimum inlet pressure, unless otherwise indicated.

- D. Air-Line Pressure Regulators, Aluminum Alloy or Plastic Body: Diaphragm operated, aluminum alloy or plastic body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for **[200 psig (1380 kPa)]<Insert pressure>** minimum inlet pressure, unless otherwise indicated.

- E. Automatic Drain Valves: Stainless steel body and internal parts, rated for **[200 psig (1380 kPa)]<Insert pressure>** minimum working pressure, capable of automatic discharge of collected condensate.**[Include mounting bracket if wall mounting is indicated.]**

- F. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded.**[Include mounting bracket if wall mounting is indicated.]**

- G. Mechanical Filters: Two-stage, mechanical-separation, air-line filters. Equip with deflector plates, resin-impregnated-ribbon filters with edge filtration, and drain cock.**[Include mounting bracket if wall mounting is indicated.]**

- H. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering airstream; with oil-feed adjustment screw and quick-release collar for easy bowl removal.**[Include mounting bracket if wall mounting is indicated.]**

1. Provide with automatic feed device for supplying oil to lubricator.

2.9 QUICK COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

1. **[Aeroquip Performance Products; Eaton, Hydraulics Sector]**
2. **[Bowes Manufacturing Inc.]**
3. **[Foster Manufacturing, Inc.]**
4. **[Milton Industries, Inc]**
5. **[Parker (Parker Hannifin)]**
6. **[Rectus Corp]**
7. **[Schrader-Bridgeport/Standard Thomson]**
8. **[TOMCO Products Inc]**
9. **[Tuthill Corporation]**
10. **<Insert manufacturer's name>**

- B. Basis-of-Design Product: Subject to compliance with requirements, provide **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

1. **[Aeroquip Performance Products; Eaton, Hydraulics Sector]**
2. **[Bowes Manufacturing Inc.]**
3. **[Foster Manufacturing, Inc.]**
4. **[Milton Industries, Inc]**
5. **[Parker (Parker Hannifin)]**
6. **[Rectus Corp]**
7. **[Schrader-Bridgeport/Standard Thomson]**
8. **[TOMCO Products Inc]**
9. **[Tuthill Corporation]**
10. **<Insert manufacturer's name>**

- C. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

- D. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless steel or nickel-plated-steel operating parts.

1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
2. Plug End: **[Flow-sensor-bleeder, check-valve][Straight-through]** type with barbed outlet for attaching hose.

- E. Valveless Quick Couplings: Straight-through brass body with stainless steel or nickel-plated-steel operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
2. Plug End: With barbed outlet for attaching hose.

2.10 HOSE ASSEMBLIES

- A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for **[300 psig (2070 kPa)]<Insert pressure>** minimum working

pressure, unless otherwise indicated.

1. Hose: Reinforced **[single-][or][double]**-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless steel fitting with barbed ends for connecting two sections of hose.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Compressed-Air Piping between Air Compressors and Receivers: Use **[one of]** the following piping materials for each size range:
1. NPS 2 (DN 50) and Smaller, Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 2. NPS 2 (DN 50) and Smaller, Pressure-Sealed: Schedule 5, galvanized-steel pipe; pressure-seal fittings; and press-seal joints.
 3. NPS 2 (DN 50) and Smaller, Welded: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
 4. NPS 2 (DN 50) and Smaller, Brazed: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed joints.
 5. 63 mm Outside Tube Diameter and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.
 6. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 7. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Grooved-End: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 8. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Welded: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
 9. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Brazed: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed joints.
 10. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Grooved-End, Copper: **Type K or L (Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 11. 73 to 115 mm: Aluminum pipe; and roll-groove couplings.
 12. NPS 5 (DN 125) and Larger, Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 13. NPS 5 (DN 125) and Larger, Grooved-End: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 14. NPS 5 (DN 125) and Larger, Welded: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
 15. NPS 5 (DN 125) and Larger, Grooved-End, Copper: Grooved-end, **ASTM B88, Type K or L (ASTM B88M, Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 16. 168 mm and Larger: Aluminum pipe; and roll-groove couplings.
- B. Low-Pressure Compressed-Air Distribution Piping: Use **[one of]** the following piping materials for each size range:
1. NPS 2 (DN 50) and Smaller, Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.

2. NPS 2 (DN 50) and Smaller, Pressure-Sealed, Steel: Schedule 5, galvanized-steel pipe; pressure-seal fittings; and pressure-sealed joints.
 3. NPS 2 (DN 50) and Smaller, Brazed or Soldered: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed[**or soldered**] joints.
 4. NPS 2 (DN 50) and Smaller, Pressure-Sealed, Copper: **Type K or L (Type A or B)**, copper tube; press-type fittings; and pressure-sealed joints.
 5. 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bit ring couplings.
 6. 63 mm and Smaller, Solvent-Fitted, Blue ABS: Pipe and fittings; transition fittings; valves; and solvent-cemented joints.
 7. NPS 2 (DN 50) and Smaller, Solvent-Fitted, Green ABS: Pipe and fittings, transition fittings, and valves; and solvent-cemented joints.
 8. NPS 2 (DN 50) and Smaller, Heat-Fused: HDPE pipe, fittings, and valves; and heat-fusion joints.
 9. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 10. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Grooved-End: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 11. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Brazed or Soldered: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed[**or soldered**] joints.
 12. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Grooved-End, Copper: **Type K or L (Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 13. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Pressure-Sealed: **Type K or L (Type A or B)**, copper tube; press-type fittings; and pressure-sealed joints.
 14. 73 to 115 mm: Aluminum pipe; and roll-groove couplings.
 15. 90 and 110 mm, Solvent-Fitted, Blue ABS: Pipe and fittings; transition fittings; and solvent-cemented joints. Include butterfly valves and flanged joints.
 16. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Solvent-Fitted, Green ABS: Green ABS pipe and fittings; transition fittings; and solvent-cemented joints. Include ball valves and flanged joints.
 17. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), Heat-Fused: HDPE pipe and fittings; valves; and heat-fusion joints.
 18. NPS 5 and NPS 6 (DN 125 and DN 150): Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 19. NPS 5 (DN 125) and Larger: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 20. NPS 5 to NPS 8 (DN 125 to DN 200): **Type K or L (Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 21. 169 to 273 mm: Aluminum pipe; and roll-groove couplings.
- C. High-Pressure Compressed-Air Distribution Piping: Use[**one of**] the following piping materials for each size range:
1. NPS 2 (DN 50) and Smaller, Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 2. NPS 2 (DN 50) and Smaller, Pressure-Sealed: Schedule 5, galvanized-steel pipe; pressure-seal fittings; and pressure-sealed joints.
 3. NPS 2 (DN 50) and Smaller, Welded: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
 4. NPS 2 (DN 50) and Smaller, Brazed or Soldered: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed[**or soldered**] joints.
 5. 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.
 6. NPS 2-1/2 to NPS 6 (DN 65 to DN 150), Threaded: Schedule 40, **[black][galvanized]**-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 7. NPS 2-1/2 to NPS 6 (DN 65 to DN 150), Grooved-End: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 8. NPS 2-1/2 to NPS 6 (DN 65 to DN 150), Welded: Schedule 40, black-steel pipe; wrought-steel

- fittings; and welded joints.
9. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed[**or soldered**] joints.
 10. NPS 2-1/2 to NPS 6 (DN 65 to DN 150), Brazed: **Type K or L (Type A or B)**, copper tube; wrought-copper fittings; and brazed joints.
 11. NPS 2-1/2 to NPS 6 (DN 65 to DN 150), Grooved-End, Copper: **Type K or L (Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 12. 73 to 168 mm: Aluminum pipe; and roll-groove couplings.
 13. NPS 8 (DN 200) and Larger, Grooved: Schedule 40, **[black][galvanized]**-steel pipe; grooved-end fittings; couplings; and grooved joints.
 14. NPS 8 (DN 200) and Larger, Welded: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.
 15. NPS 8 (DN 200), Grooved-End: **Type K or L (Type A or B)**, copper tube; grooved-end copper fittings; couplings; and grooved joints.
 16. 220 and 274 mm: Aluminum pipe; and roll-groove couplings.

D. Drain Piping: Use[**one of**] the following piping materials:

1. NPS 2 (DN 50) and Smaller: **Type M (Type C)** copper tube; wrought-copper fittings; and brazed or soldered joints.
2. 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.

3.2 VALVE APPLICATIONS

- A. Metal General-Duty Valves: Comply with requirements and use valve types specified in "Valve Applications" Article in Section 220523 "General-Duty Valves for Plumbing Piping," according to the following:
1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
 2. High-Pressure Compressed Air: Valve types specified for high-pressure compressed air.
 3. Equipment Isolation NPS 2 (DN 50) and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
 4. Grooved-end valves may be used with grooved-end piping and grooved joints.
- B. General-Duty Valves for Aluminum Piping System: Provide valves, made by piping system manufacturer, that are compatible with piping.
1. Ball Valves, 63 mm and Smaller: NPT ends, or push-connect bite ring ends.
 2. Butterfly Valves, 73 mm and Larger: Tube to tube, with two roll-groove end couplings.
- C. Plastic General-Duty Valves: Provide valves, made by piping manufacturer, that are compatible with piping. Do not use plastic valves between air compressors and receivers.
1. Blue ABS Piping System: Ball and butterfly valves.
 2. Green ABS Piping System: Ball valves.
 3. HDPE Piping System: Ball valves.

3.3 INSTALLATION OF PIPING, GENERAL

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless

deviations to layout are approved on Coordination Drawings.

- B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless otherwise indicated.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.
- E. Where installing piping adjacent to equipment and machines, allow space for service and maintenance.
- F. Install air and drain piping with 1 percent slope downward in direction of flow.
- G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating unless otherwise indicated.
- H. Equipment and Specialty Flanged Connections:
 - 1. Use steel companion flange with gasket for connection to steel pipe.
 - 2. Use cast-copper-alloy companion flange with gasket and brazed[**or soldered**] joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.
- I. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, in accordance with Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F2014.
- J. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- K. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- L. Install pressure gauge on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220500 "Common Work Results for Plumbing."
- M. Install piping to permit valve servicing.
- N. Install piping free of sags and bends.
- O. Install fittings for changes in direction and branch connections.
- P. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.4 INSTALLATION OF ALUMINUM PIPING SYSTEMS

- A. Install aluminum piping systems in accordance with manufacturer's written instructions, using manufacturer's recommended tools, accessories, and methods.
- B. Install branch connections **[NPS 2-1/2 (DN 65)][73 mm]** and larger, to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- C. Install branch connections **[NPS 2 (DN 50)][63 mm]** and smaller, to compressed-air mains using aluminum piping system reducing outlet tee with water trapping capabilities. Provide drain leg and drain trap at end of each main and branch and at low points.
- D. Support aluminum pipe using manufacturer's hangers and supports, designed for use with the system.
- E. Allow for expansion and contraction of aluminum piping system.
- F. Do not use plastic components or plastic fittings of any kind within pressurized aluminum piping system. This limitation applies to main headers, branches, and drops.

3.5 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints for Steel Piping: Join in accordance with AWS D10.12/D10.12M.
- E. Brazed Joints for Copper Tubing: Join in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Join in accordance with ASTM B828 or CDA's "Copper Tube Handbook."
- G. Extruded-Tee Outlets for Copper Tubing: Form branches in accordance with ASTM F2014, with tools recommended by procedure manufacturer, and using operators qualified in accordance with "Quality Assurance" Article.
- H. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts in accordance with ASME B31.9 for bolting procedure.
- I. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join in accordance with AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.
- J. Heat-Fusion Joints for PE Piping: Clean and dry joining surfaces by wiping with clean cloth or paper

towels. Join in accordance with ASTM D2657 for socket-fusion joints.

- K. Press-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators qualified in accordance with "Quality Assurance" Article.
- L. Solvent-Cemented Joints for ABS Piping: Clean and dry joining surfaces. Join according to the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. Join in accordance with ASME B31.9 for solvent-cemented joints and with ASTM D2235 Appendix.
- M. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.6 INSTALLATION OF VALVES

- A. General-Duty Valves: Comply with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."

3.7 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. NPS 2 (DN 50) and Smaller: Use dielectric unions.
- C. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
- D. NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.8 INSTALLATION OF FLEXIBLE PIPE CONNECTORS

- A. Install flexible pipe connectors in discharge piping[**and in inlet air piping from remote air-inlet filter**] of each air compressor.
- B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.
- C. Install stainless steel-hose flexible pipe connectors in steel compressed-air piping.

3.9 INSTALLATION OF SPECIALTIES

- A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
- B. Install air-main pressure regulators in compressed-air piping at or near air compressors.
- C. Install air-line pressure regulators in branch piping to equipment[**and tools**].
- D. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters.[**Mount on wall at locations indicated.**]
- E. Install air-line lubricators in branch piping to machine tools.[**Mount on wall at locations indicated.**]

- F. Install quick couplings at piping terminals for hose connections.
- G. Install hose assemblies at hose connections.

3.10 PIPING CONNECTIONS

- A. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.
- B. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.11 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for hangers, supports, and anchor devices.
- C. Install hangers for **[copper tubing][and][steel piping]**, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for **[ABS][HDPE][aluminum]** piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within **[12 inches (300 mm)]<Insert dimension>** of each fitting and coupling.
- F. Support vertical runs of **[copper tubing][and][steel piping]** to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of **[ABS][HDPE][aluminum]** piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Ft. (30 m) or Less: MSS Type 1, adjustable, steel clevis hangers.
 - 2. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.
- I. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- J. Base of Vertical Piping: MSS Type 52, spring hangers.
- K. Install vinyl-coated hangers for **[ABS][HDPE]** piping.

3.12 LABELING AND IDENTIFICATION

- A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.13 FIELD QUALITY CONTROL

- A. Perform field tests and inspections.
- B. Tests and Inspections:
 - 1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of **50 psig (345 kPa)** above system operating pressure, but not less than **[150 psig (1035 kPa)]<Insert pressure>**. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 2. Piping Leak Tests for Aluminum Compressed-Air Piping: Test new piping system and modified parts of existing piping system. Cap and fill general-service compressed-air piping system to pressure of **15 psig (105 kPa)**, hold pressure for 10 minutes. Repeat until reaching required operating pressure, not to exceed **220 psig (1515 kPa)**. Once desired operating pressure is met, let stand for one hour.
 - 3. Piping Leak Tests for ABS Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen, at temperature of **110 deg F (43 deg C)** or less, to pressure of **[40 psig (275 kPa)]<Insert pressure>** above system operating pressure, but not less than **[80 psig (550 kPa)][100 psig (690 kPa)]<Insert pressure>** or more than **120 psig (825 kPa)**. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 4. Piping Leak Tests for HDPE Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen, at temperature of **100 deg F (38 deg C)** or less, to pressure of **[40 psig (275 kPa)]<Insert pressure>** above system operating pressure, but not less than **[100 psig (690 kPa)][125 psig (860 kPa)][150 psig (1035 kPa)]<Insert pressure>** or more than **180 psig (1240 kPa)**. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 5. Repair leaks and retest until no leaks exist.
 - 6. Inspect **[filters][lubricators][and][pressure regulators]** for proper operation.
- C. Prepare test and inspection reports.

END OF SECTION 22 15 13 00



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