PROJECT MANUAL

San Bernardino Animal Care Center

18313 Valley Blvd.
Bloomington, CA 92313

MILLER architecture

1177 Idaho St., Ste. 200
Redlands, CA 92374
Phone: 909.335-7400

MILLER Project No.: 2200065.RA

SPECIFICATIONS TABLE of CONTENTS

DIVISION 01: GENERAL REQUIREMENTS

TECHNICAL SPECIFICATIONS

DIVISION 02: EXISTING CONDITIONS

02 4000 DEMOLITION AND STRUCTURE MOVING

02 4113 SELECTIVE SITE DEMOLITION

DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

03 1000 CONCRETE FORMWORK
03 1113 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING
03 1511 CONCRETE ANCHORS
03 1513 WATER-STOPS

03 2000 CONCRETE REINFORCING

03 2000 CONCRETE REINFORCEMENT

03 3000 CAST-IN-PLACE CONCRETE

03 3000 CAST-IN-PLACE CONCRETE
03 3517 CONCRETE SEALER FINISHING
03 3923 MEMBRANE CONCRETE CURING

03 4000 PRECAST CONCRETE

03 4800 PRECAST CONCRETE SPECIALTIES

03 6000 GROUTING

03 6213 NON-METALLIC NON-SHRINK GROUT

DIVISION 04: MASONRY

04 0500 COMMON WORK RESULTS FOR MASONRY

04 0501 COMMON MASONRY REQUIREMENTS
04 0513 CEMENT AND LIME MASONRY MORTARING
04 0516 MASONRY GROUTING
04 0519 MASONRY ANCHORS AND INSERTS
04 0520 MASONRY REINFORCING

04 2000 UNIT MASONRY

04 22 00 REINFORCED UNIT MASONRY
04 2223 ARCHITECTURAL CONCRETE UNIT MASONRY

DIVISION 05: METALS

05 0500 COMMON WORK RESULTS OF METALS

05 0503 SHOP APPLIED METAL COATINGS

05 1000 STRUCTURAL METAL FRAMING SEE STRUCTURAL DRAWINGS

05 1223 STRUCTURAL STEEL

DIVISION 22: PLUMBING

22 0500 COMMON WORK RESULTS FOR PLUMBING

22 1000 PLUMBING PIPES AND PUMPS

22 3000 PLUMBING EQUIPMENT

22 4000 PLUMBING FIXTURES

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

23 3000 HVAC AIR DISTRIBUTION

23 4000 HVAC AIR CLEANING DEVICES

23 7000 CENTRAL HVAC EQUIPMENT

SECTION 00 0115

LIST OF DRAWING SHEETS

San Bernardino Animal Care Center

GENERAL

G-001 TITLE SHEET

G-002 SHEET INDEX

G-003 CAL GREEN SHEET 1

G-004 CAL GREEN SHEET 2

G-005 CAL GREEN SHEET 3

G-006 CODE ANALYSIS/ FIRE MASTER PLAN

G-007A 1ST FLOOR CODE ANALYSIS BLDG AA

G-007B 2ND FLOOR CODE ANALYSIS BLDG AA

G-008 CODE ANALYSIS BLDG AB & AC

G-009 CODE ANALYSIS BLDG. AD

G-010 CODE ANALYSIS BLDG'S AE-AH.1

G-011 CODE ANALYSIS BLDG AI

G-012 CODE ANALYSIS BLDG'S AJ & AK

G-501 ADA DETAILS

CIVIL

1 OF 1 TOPOGRAPHIC MAP

1 OF 2 STREET IMPROVEMENT PLAN TITLE SHEET

2 OF 2 STREET IMPROVEMENT PLAN & PROFILE

1 OF 3 SEWER PLAN TITLE SHEET

2 OF 3 SEWER PLAN & PROFILE

3 OF 3 SEWER PLAN DETAILS

1 OF 14 GRADING PLAN TITLE SHEET

2 OF 14 GRADING PLAN DETAILS

3 OF 14 GRADING PLAN

4 OF 14 GRADING PLAN

5 OF 14 GRADING PLAN COMPOSITE UTILITY PLAN

6 OF 14 GRADING PLAN SD PLAN & PROFILE

7 OF 14 GRADING PLAN SD PLAN & PROFILE

8 OF 14 GRADING PLAN SD PLAN & PROFILE

9 OF 14 GRADING PLAN SD PLAN & PROFILE

10 OF 14 GRADING PLAN DETAILS

11 OF 14 GRADING PLAN DETAILS

12 OF 14 GRADING PLAN DETAILS

13 OF 14 GRADING PLAN EROSION CONTROL

14 OF 14 GRADING PLAN EROSION CONTROL

1 OF 7 WALL PLAN TITLE SHEET

2 OF 7 WALL PLAN DETAILS

3 OF 7 WALL PLAN DETAILS

4 OF 7 WALL PLAN SPECIAL INSPECTION

5 OF 7 WALL PLAN & PROFILE

6 OF 7 WALL PLAN & PROFILE

8 OF 8 WALL PLAN & PROFILE

LANDSCAPING

T-1 TITLE SHEET

CL-1 LANDSCAPE CONSTRUCTION PLAN

CL-2 LANDSCAPE CONSTRUCTION PLAN

CD-1 LANDSCAPE CONSTRUCTION DETAILS

LI-1 IRRIGATION PLAN

LI-2 IRRIGATION PLAN

LID-1 IRRIGATION DETAILS

LP-1 PLANTING PLAN

LP-2 PLANTING PLAN

LPD-1 PLANTING DETAILS & WATER USE CALCS

LIS-1 IRRIGATION SPECIFICATIONS

LPS-1 PLANTING SPECIFICATIONS

ARCHITECTURAL

AS-100 SITE PLAN- BID ALTERNATES

AS-101 SITE PLAN - ANNOTATED

AS-102 SITE PLAN - DIMENSIONED

AS-103 ENLARGED SITE PLAN

AS-104 ENLARGED SITE PLAN

AS-105 TRASH ENCLOSURE DETAILS

AS-106 ENLARGED SITE PLAN

AS-107 ENLARGED SITE PLAN

AS-108 ENLARGED SITE PLAN

AS-501 SITE DETAILS

AS-502 SITE DETAILS

AA100 BUILDING AA LAYOUT PLAN

AA101 ADMINISTRATION 1ST FLOOR DIMENSION PLAN

AA101.2 ADMINISTRATION 1ST FLOOR ANNOTATION PLAN

AA102 ADMINISTRATION 2ND FLOOR DIMENSION PLAN

AA102.2 ADMINISTRATION 2ND FLOOR ANNOTATION PLAN

AA103 ADMINISTRATION 1ST FLOOR REFLECTED CEILING PLAN

AA104 ADMINISTRATION 2ND FLOOR REFLECTED CEILING PLAN

AA105 ADMINISTRATION ROOF PLAN

AA201 ADMINISTRATION ELEVATIONS

AA301 ADMINISTRATION BUILDING SECTIONS

AA302 ADMINISTRATION BUILDING SECTIONS

AA303 ADMINISTRATION BUILDING SECTIONS

AA304 ADMINISTRATION WALL SECTIONS

AA305 WALL SECITONS

AA306 WALL SECTIONS

AA307 WALL SECTIONS

AA308 WALL SECTIONS

AA309 WALL SECTIONS

AA310 WALL SECTIONS

AA311 WALL SECTIONS

AA401 ENLARGED PUBLIC RESTROOM PLAN

AA402 ENLARGED STAFF RESTROOM & BREAKROOM

AA403 ENLARGED LOBBY PLAN

AA404 CANOPY PLAN

AA405 ENLARGED STAIR PLAN

AA406 ELEVATOR PLAN

AA407 ADMINISTRATION BUILDING INTERIOR ELEVATIONS

AA601 DOOR SCHEDULE

AA602 WINDOW SCHEDULE

AA603 FINISH SCHEDULE

AB100 BUILDING AB LAYOUT FLOOR PLAN

AB101 MEDICAL & DOG CLINIC DIMENSION FLOOR PLAN

AB102 MEDICAL & DOG CLINIC ANNOTATION FLOOR PLAN

AB103 MEDICAL & DOG CLINIC REFLECTED CEILING PLAN

AB105 MEDICAL CLINIC AND DOG CLINIC- ROOF PLAN

AB201 MEDICAL & DOG CLINIC ELEVATIONS

AB202 MEDICAL DOG ELEVATIONS

AB301 MEDICAL & DOG CLINIC BUILDING SECTIONS

AB302 WALL SECTIONS

AB303 WALL SECTIONS

AB304 WALL SECTIONS

AB305 WALL SECTIONS

AB306 WALL SECTIONS

AB307 WALL SECTIONS

AB308 WALL SECTIONS

AB401 ENLARGED STAFF RESTROOM PLAN

AB501 DETAILS

AB601 DOOR & WINDOW SCHEDULES

AB602 DOOR SCHEDULE

AB603 FINISH SCHEDULE

AD100 CAT BUILDING LAYOUT PLAN

AD101 CAT BUILDING DIMENSION FLOOR PLAN

AD102 CAT BUILDING ANNOTATION FLOOR PLAN

AD103 CAT BUILDING REFLECTED CEILING PLAN

AD105 CAT BUILDING ROOF PLAN

AD201 CAT BUILDING EXTERIOR ELEVATIONS

AD301 CAT BUILDING SECTIONS

AD303 CAT BUILDING WALL SECTIONS

AD401 CAT AND OTHER ENLARGED PLANS

AD601 DOOR AND WINDOW SCHEDULE

AE100 AE - AH.1 LAYOUT PLAN

AE101 ADOPTION DOG AE-AH DIMENSION FLOOR PLAN

AE102 ADOPTION DOG AE-AH ANNOTATION FLOOR PLAN

AE103 ADOPTION DOG AE-AH REFLECTED CEILING PLAN

AE105 ADOPTION DOG AE-AH ROOF PLAN

AE201 ADOPTION DOG AE-A ELEVATIONS

AE301 ADOPTION DOG AE-AH BUILDING SECTIONS

AE302 WALL SECTIONS

AE303 ADOPTION DOG WALL SECTIONS

AE601 WINDOW/ DOOR SCHEDULES

AE602 FINISH SCHEDULE

AI100 SUPPORT LAYOUT PLAN

AI101 SUPPORT BUILDING DIMENSION FLOOR PLAN

AI102 SUPPORT BUILDING ANNOTATION PLAN

AI103 SUPPORT BUILDING REFLECTED CEILING PLAN

AI105 SUPPORT BUILDING ROOF PLAN

AI201 SUPPORT BUILDING EXTERIOR ELEVATIONS

AI301 SUPPORT BUILDING SECTIONS

AI303 SUPPORT BUILDING WALL SECTIONS

AI304 WALL SECTIONS

AI401 ENLARGED PLANS / INTERIOR ELEVATIONS

AI402 ENLARGED PLANS / INTERIOR ELEVATIONS

AI601 DOOR / WINDOW SCHEDULES

AI602 FINISH SCHEDULE

AJ100 ADOPTION DOG LAYOUT PLAN

AJ101 ADOPTION DOG J&K DIMENSION FLOOR PLAN

AJ102 ADOPTION DOG J&K ANNOTATION FLOOR PLAN

AJ103 ADOPTION DOG J&K RCP

AJ105 ADOPTION DOG J&K ROOF PLAN

AJ201 ADOPTION DOG J&K ELEVATIONS

AJ301 ADOPTION DOG J&K BUILDING SECTIONS

AJ303 ADOPTION DOG J&K WALL SECTIONS

AJ601 ADOPTION DOG J&K DOOR / WINDOW SCHEDULES

A-501 DETAILS

A-502 DETAILS

A-503 DETAILS

A-504 DETAILS

A-505 DETAILS

STRUCTURAL

S-101 GENERAL NOTES

S-102 GENERAL NOTES

S-103 LOADING DIAGRAMS

SS-200 SITE PLAN

SA-201 ADMINISTRATION BUILDING FOUNDATION PLAN

SA-202 ADMINISTRATION BUILDING STRUCTURAL SECOND FLOOR CEILING PLAN

SA-203 ADMINISTRATION BUILDING STRUCTURAL SECOND FLOOR FRAMING ROOF PLAN

SA-204 ADMINISTRATION BUILDING ROOF CEILING PLAN

SA-205 ADMINISTRATION BUILDING ROOF FRAMING PLAN

SA-206 ADMINISTRATION BUILDING SECTIONS

SA-207 ADMINISTRATION BUILDING SECTIONS

SA-208 ADMINISTRATION BUILDING MOMENT FRAME ELEVATIONS

SBC-201 MEDICAL CLINIC STRUCTURAL FOUNDATION PLAN

SBC-202 MEDICAL CLINIC STRUCTURAL CEILING PLAN

SBC-203 MEDICAL CLINIC STRUCTURAL ROOF PLAN

SBC-204 MEDICAL CLINIC BUILDING SECTIONS

SBC-205 MEDICAL CLINIC WALL ELEVATIONS

SBC-206 MEDICAL CLINIC WALL ELEVATIONS

SD-201 CAT BUILDING FOUNDATION PLAN

SD-202 CAT BUILDING CEILING PLAN

SD-203 CAT BUILDING ROOF PLAN

SD-204 CAT BUILDING SECTIONS

SE-201 ADOPTION DOG BUILDING FOUNDATION PLAN

SE-202 ADOPTION DOG BUILDING CEILING PLAN

SE-203 ADOPTION DOG BUILDING ROOF PLAN

SE-204 ADOPTION DOG BUILDING ELEVATIONS

SE-205 ADOPTION DOG BUILDING WALL ELEVATIONS

SE-206 ADOPTION DOG BUILDING WALL ELEVATIONS

SI-201 SUPPORT BUILDING STRUCTURAL FLOOR PLAN

SI-202 SUPPORT BUILDING CEILING PLAN PLAN

SI-203 SUPPORT BUILDING ROOF PLAN

SI-204 SUPPORT BUILDING SECTIONS

SJ-201 ADOPTION DOG BUILDING FOUNDATION PLAN

SJ-202 ADOPTION DOG BUILDING CEILING PLAN

SJ-203 ADOPTION DOG BUILDING ROOF PLAN

SJ-204 ADOPTION DOG BUILDING WALL ELEVATIONS

SJ-205 ADOPTION DOG BUILDING WALL ELEVATIONS AND SECTIONS

SS-201 TRASH ENCOLSURE

SS-202 TRUCK WASH

S-300 TYPICAL CONCRETE DETAILS

S-301 TYPICAL CONCRETE DETAILS

S-302 TYPICAL CONCRETE DETAILS

S-303 TYPICAL CONCRETE DETAILS

S-304 TYPICAL CONCRETE DETAILS

S-400 TYPICAL CMU DETAILS

S-500 TYPICAL STEEL DETAILS

S-501 TYPICAL STEEL DETAILS

S-502 TYPICAL STEEL DETAILS

S-503 TYPICAL STEEL DETAILS

S-504 TYPICAL STEEL DETAILS

S-505 TYPICAL STEEL DETAILS

S-700 TYPICAL EXTERIOR METAL STUD DETAILS

S-701 TYPICAL EXTERIOR METAL STUD DETAILS

S-702 TYPICAL INTERIOR METAL STUD DETAILS

S-703 TYPICAL INTERIOR METAL STUD DETAILS

S-704 TYPICAL METAL STUD DETAILS

S-705 TYPICAL METAL STUD DETAILS

S-706 TYPICAL METAL STUD SHEAR WALL DETAILS

S-707 TYPICAL METAL STUD DETAILS

S-708 TYPICAL METAL STUD DETAILS

S-709 TYPICAL METAL STUD DETAILS

S-710 TYPICAL METAL STUD DETAILS

S-711 TYPICAL FRAMING DETAILS

S-800 EQUIPMENT ANCHORAGE DETAILS

MECHANICAL

M-100 MECHANICAL COVERSHEET

M-101 SCHEDULES

M-102 SCHEDULES

M-103 TITLE 24 DOCUMENTATION

M-104 TITLE 24 DOCUMENTATION

M-105 TITLE 24 DOCUMENTATION

M-106 TITLE 24 DOCUMENTATION

M-107 TITLE 24 DOCUMENTATION

M-108 TITLE 24 DOCUMENTATION

M-109 TITLE 24 DOCUMENTATION

M-110 TITLE 24 DOCUMENTATION

M-111 TITLE 24 DOCUMENTATION

MS-101 MECHANICAL SITE PLAN

MA-101 ADMINISTRATION BUILDING MECHANICAL FIRST FLOOR PLAN

MA-102 ADMINISTRATION BUILDING MECHANICAL SECOND FLOOR PLAN

MA-103 ADMINISTRATION BUILDING MECHANICAL ROOF PLAN

MA-105 ADMINISTRATION BUILDING MECHANICAL ISOMETRIC VIEWS

MBC-101 MEDICAL CLINIC MECHANICAL FLOOR PLAN

MBC-102 MEDICAL CLINIC MECHANICAL ROOF PLAN

MBC-103 MEDICAL CLINIC MECHANICAL ISOMETRIC VIEWS

MD-101 CAT & OTHER ANIMALS BUILDING MECHANICAL FLOOR PLAN

MD-102 CAT & OTHER ANIMALS BUILDING MECHANICAL ROOF PLAN

ME-101 ADOPTION DOG BUILDING 1 MECHANICAL FLOOR PLAN

ME-102 ADOPTION DOG BUILDING 1 MECHANICAL ROOF PLAN

ME-103 ADOPTION DOG BUILDING ISOMETRIC VIEWS

MF-101 ADOPTION DOG BUILDING 2 MECHANICAL FLOOR PLAN

MF-102 ADOPTION DOG BUILDING 2 MECHANICAL ROOF PLAN

MG-101 ADOPTION DOG BUILDING 3 MECHANICAL FLOOR PLAN

MG-102 ADOPTION DOG BUILDING 3 MECHANICAL ROOF PLAN

MH-101 STRAY DOG BUILDING MECHANICAL FLOOR PLAN

MH-102 STRAY DOG BUILDING MECHANICAL ROOF PLAN

MH.1-101 ADOPTION DOG BUILDING 4 MECHANICAL FLOOR PLAN

MH.1-102 ADOPTION DOG BUILDING 4 MECHANICAL ROOF PLAN

MI-101 SUPPORT BUILDING MECHANICAL FLOOR PLAN

MI-102 SUPPORT BUILDING ISOMETRIC VIEWS

MJ-101 ADOPTION DOG BUILDING 5 MECHANICAL FLOOR PLAN

MJ-102 ADOPTION DOG BUILDING 5 MECHANICAL ROOF PLAN

MK-101 ADOPTION DOG BUILDING 6 MECHANICAL FLOOR PLAN

MK-102 ADOPTION DOG BUILDING 6 MECHANICAL ROOF PLAN

M-201 MECHANICAL DETAILS

M-202 MECHANICAL DETAILS

M-203 WIRING DIAGRAMS

M-204 MECHANICAL DETAILS

M-205 WIRING DIAGRAMS

M-300 CONTROLS

M-301 CONTROLS

ELECTRICAL

E-100 ELECTRICAL COVERSHEET

E-101 SINGLE LINE DIAGRAM

E-102 SINGLE LINE DIAGRAM (CONT'D)

E-104 LUMINAIRE SCHEDULE

E-105 ELECTRICAL SCHEDULES

E-106 ELECTRICAL SCHEDULES

E-107 ELECTRICAL SCHEDULES

E-109 ELECTRICAL SCHEDULES

E-110 ELECTRICAL SCHEDULES

E-111 ELECTRICAL EVC SCHEDULES

E-112 NRCC LTO CODE COMPLIANCE ADOPTION BLDG

E-113 NRCC LTI CODE COMPLIANCE ADMIN BLDG

E-300 DETAILS

E-301 DETAILS

E-302 DETAILS

E-400 ELECTRICAL ENLARGED PLANS

ES-100 ELECTRICAL EQUIPMENT CONNECTION

ES-101 POWER SITE PLAN

ES-102 LIGHTING SITE PLAN

ES-103 SITE PLAN PHOTOMETRICS

EA-101 ADMINISTRATION BUILDING LIGHTING FIRST FLOOR PLAN

EA-102 ADMINISTRATION BUILDING LIGHTING SECOND FLOOR PLAN

EA-201 ADMINISTRATION BUILDING POWER FIRST FLOOR PLAN

EA-202 ADMINISTRATION BUILDING POWERL SECOND FLOOR PLAN

EA-203 ADMINISTRATION BUILDING POWER ROOF PLAN

EA-211 ADMINISTRATION BUILDING MECHANICAL EQUIPMENT POWER FIRST FLOOR PLAN

EA-212 ADMINISTRATION BUILDING MECHANICAL EQUIPMENT POWER SECOND FLOOR PLAN

EBC-101 MEDICAL CLINIC LIGHTING FLOOR PLAN

EBC-201 MEDICAL CLINIC POWER FLOOR PLAN

EBC-202 MEDICAL CLINIC POWER ROOF PLAN

ED-101 CAT & OTHER ANIMALS BUILDING LIGHTING FLOOR PLAN

ED-201 CAT & OTHER ANIMALS BUILDING POWER FLOOR PLAN

ED-202 CAT & OTHER ANIMALS BUILDING POWER ROOF PLAN

EE-101 ADOPTION DOG BUILDING 1 LIGHTING FLOOR PLAN

EE-201 ADOPTION DOG BUILDING 1 POWER FLOOR PLAN

EE-202 ADOPTION DOG BUILDING 1 POWER ROOF PLAN

EF-101 ADOPTION DOG BUILDING 2 LIGHTING FLOOR PLAN

EF-201 ADOPTION DOG BUILDING 2 POWER FLOOR PLAN

EF-202 ADOPTION DOG BUILDING 2 POWER ROOF PLAN

EG-101 ADOPTION DOG BUILDING 3 LIGHTING FLOOR PLAN

EG-201 ADOPTION DOG BUILDING 3 POWER FLOOR PLAN

EG-202 ADOPTION DOG BUILDING 3 POWER ROOF PLAN

EH-101 STRAY DOG BUILDING LIGHTING FLOOR PLAN

EH-201 STRAY DOG BUILDING POWER FLOOR PLAN

EH-202 STRAY DOG BUILDING POWER ROOF PLAN

EH.1-101 ADOPTION DOG BUILDING 4 LIGHTING PLAN

EH.1-201 ADOPTION DOG BUILDING 4 POWER FLOOR PLAN

EH.1-202 ADOPTION DOG BUILDING 4 POWER ROOF PLAN

EI-101 SUPPORT BUILDING LIGHTING FLOOR PLAN

EI-201 SUPPORT BUILDING POWER FLOOR PLAN

EJ-101 ADOPTION DOG BUILDING 5 LIGHTING FLOOR PLAN

EJ-201 ADOPTION DOG BUILDING 5 POWER FLOOR PLAN

EJ-202 ADOPTION DOG BUILDING 5 POWER ROOF PLAN

EK-101 ADOPTION DOG BUILDING 6 LIGHTING FLOOR PLAN

EK-201 ADOPTION DOG BUILDING 6 POWER FLOOR PLAN

EK-202 ADOPTION DOG BUILDING 6 POWER ROOF PLAN

PLUMBING

P-100 PLUMBING COVERSHEET

P-101 SCHEDULES

P-102 CALCULATIONS

PS-101 PLUMBING SITE PLAN

PA-101 ADMINISTRATION BUILDING PLUMBING UNDERFLOOR PLAN

PA-102 ADMINISTRATION BUILDING PLUMBING FIRST FLOOR PLAN

PA-103 ADMINISTRATION BUILDING PLUMBING SECOND FLOOR PLAN

PA-104 ADMINISTRATION BUILDING PLUMBING ROOF PLAN

PBC-101 MEDICAL CLINIC PLUMBING UNDERFLOOR PLAN

PBC-102 MEDICAL CLINIC PLUMBING FLOOR PLAN

PBC-103 MEDICAL CLINIC PLUMBING ROOF PLAN

PD-101 CAT & OTHER ANIMALS BUILDING PLUMBING UNDERFLOOR PLAN

PD-102 CAT & OTHER ANIMALS BUILDING PLUMBING FLOOR PLAN

PD-103 CAT & OTHER ANIMALS BUILDING PLUMBING ROOF PLAN

PE-101 ADOPTION DOG BUILDING 1 PLUMBING UNDERFLOOR PLAN

PE-102 ADOPTION DOG BUILDING 1 PLUMBING FLOOR PLAN

PE-103 ADOPTION DOG BUILDING 1 PLUMBING ROOF PLAN

PF-101 ADOPTION DOG BUILDING 2 PLUMING UNDERFLOOR PLAN

PF-102 ADOPTION DOG BUILDING 2 PLUMBING FLOOR PLAN

PF-103 ADOPTION DOG BUILDING 2 PLUMBING ROOF PLAN

PG-101 ADOPTION DOG BUILDING 3 PLUMBING UNDERFLOOR PLAN

PG-102 ADOPTION DOG BUILDING 3 PLUMBING FLOOR PLAN

PG-103 ADOPTION DOG BUILDING 3 PLUMBING ROOF PLAN

PH-101	STRAY DOG BUILDING PLUMBING UNDERFLOOR PLAN
PH-102	STRAY DOG BUILDING PLUMBING FLOOR PLAN
PH-103	STRAY DOG BUILDING PLUMBING ROOF PLAN
PH.1-101	ADOPTION DOG BUILDING 4 PLUMBING UNDERFLOOR PLAN
PH.1-102	ADOPTION DOG BUILDING 4 PLUMBING FLOOR PLAN
PH.1-103	ADOPTION DOG BUILDING 4 PLUMBING ROOF PLAN
PI-101	SUPPORT BUILDING PLUMBING UNDERFLOOR PLAN
PI-102	SUPPORT BUILDING PLUMBING FLOOR PLAN
PI-103	SUPPORT BUILDING PLUMBING ROOF PLAN
PJ-101	ADOPTION DOG BUILDING 5 PLUMBING UNDERFLOOR PLAN
PJ-102	ADOPTION DOG BUILDING 5 PLUMBING FLOOR PLAN
PJ-103	ADOPTION DOG BUILDING 5 PLUMBING ROOF PLAN
PK-101	ADOPTION DOG BUILDING 6 PLUMBING UNDERFLOOR PLAN
PK-102	ADOPTION DOG BUILDING 6 PLUMBING FLOOR PLAN
PK-103	ADOPTION DOG BUILDING 6 PLUMBING ROOF PLAN
P-300	PLUMBING DETAILS
P-301	PLUMBING DETAILS
P-302	PLUMBING DETAILS

FIRE ALARM

FA-100	FIRE ALARM COVERSHEET
FA-101	FIRE ALARM COVERSHEET CONTINUED
FAS-101	FIRE ALARM SITE PLAN
FAA-101	ADMINISTRATION BUILDING FIRE ALARM FIRST FLOOR PLAN
FAA-102	ADMINISTRATION BUILDING FIRE ALARM SECOND FLOOR PLAN
FABC-101	MEDICAL CLINIC FIRE ALARM FLOOR PLAN
FAD-101	CAT & OTHER ANIMALS BUILDING FIRE ALARM FLOOR PLAN
FAE-101	ADOPTION DOG BUILDING 1 FIRE ALARM FLOOR PLAN
FAF-101	ADOPTION DOG BUILDING 2 FIRE ALARM FLOOR PLAN
FAG-101	ADOPTION DOG BUILDING 3 FIRE ALARM FLOOR PLAN
FAH-101	STRAY DOG BUILDING FIRE ALARM FLOOR PLAN
FAH.1-101	ADOPTION DOG BUILDING 4 FIRE ALARM FLOOR PLAN
FAI-101	SUPPORT BUILDING FIRE ALARM FLOOR PLAN
FAJ-101	ADOPTION DOG BUILDING 5 FIRE ALARM FLOOR PLAN

FAK-101 ADOPTION DOG BUILDING 6 FIRE ALARM FLOOR PLAN

FAL-101 ADOPTION DOG BUILDING 7 FIRE ALARM FLOOR PLAN

FA-200 DETAILS

TECHNOLOGY

T-100 TECHNOLOGY COVERSHEET

T-101 SCHEDULES

T-102 SCHEDULES

T-103 SCHEDULES

TS-101 TECHNOLOGY SITE PLAN

TA-101 AA - ADMINISTRATION BUILDING TECHNOLOGY FIRST FLOOR PLAN

TA-102 AA - ADMINISTRATION BUILDING TECHNOLOGY SECOND FLOOR PLAN

TBC-101 AB & AC - MEDICAL CLINIC TECHNOLOGY FLOOR PLAN

TD-101 AD - CAT & OTHER ANIMALS BUILDING TECHNOLOGY FLOOR PLAN

TE-101 AE - ADOPTION DOG BUILDING 1 TECHNOLOGY FLOOR PLAN

TF-101 AF- ADOPTION DOG BUILDING 2 TECHNOLOGY FLOOR PLAN

TG-101 AG - ADOPTION DOG BUILDING 3 TECHNOLOGY FLOOR PLAN

TH-101 AH - STRAY DOG BUILDING TECHNOLOGY FLOOR PLAN

TH.1-101 AH.1 - ADOPTION DOF BUILDING 4 TECHNOLOGY FLOOR PLAN

TI-101 AI - SUPPORT BUILDING TECHNOLOGY FLOOR PLAN

TJ-101 AJ - DOG BUILDING TECHNOLOGY FLOOR PLAN

TK-101 AK - DOG BUILDING TECHNOLOGY FLOOR PLAN

T-200 DETAILS

T-201 DETAILS

T-202 DETAILS

T-203 DETAILS

T-204 DETAILS

T-300 DIAGRAMS

T-301 DIAGRAMS

T-302 DIAGRAMS

T-400 TECHNOLOGY ENLARGED PLANS

T-401 TECHNOLOGY ENLARGED PLANS

T-402 TECHNOLOGY ENLARGED PLANS

EQUIPMENT

AE1 ANIMAL EQUIPMENT PLAN- ADMINISTRATION FIRST FLOOR

AE2 ANIMAL EQUIPMENT PLAN- CAT AND OTHER ANIMALS BUILDING

AE3 ANIMAL EQUIPMENT PLAN- SUPPORT BUILDING

AE4 ANIMAL EQUIPMENT PLAN- ADOPTION DOG AND STRAY DOG BUILDING

AE5 ANIMAL EQUIPMENT PLAN- MEDICAL BUILDING

AE6 ANIMAL EQUIPMENT DETAILS

AE7 ANIMAL EQUIPMENT DETAILS

AE8 ANIMAL EQUIPMENT DETAILS

SHADE STRUCTURE

1000 JOINED 3PT SAILS - USA SHADE & FABRIC STRUCTURES

FREEZER

AD-1 OF 3 KOLPAK WALK-IN FREEZER LAYOUT

AD-2 OF 3 KOLPAK WALK IN FREEZER DETAILS

AD-3 OF 3 KOLPAK WALK IN FREEZER DETAILS

TOTAL: 426

END OF DOCUMENT

SECTION 01 91 00 - COMMISSIONING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description

B. Commissioning Process

C. Related Work

1.2 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing, adjusting and balancing, performance testing, and training.

B. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify applicable equipment and systems are installed according to the Owner's project requirements, manufacturer's recommendations, and industry accepted minimum standards.
2. Verify applicable equipment and systems receive adequate operational checkout by installing contractors.
3. Observe and document proper performance of equipment and systems.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

D. Abbreviations. The following are common abbreviations that may be used in the specifications and the Commissioning Plan.

1. A/E Architects and Engineers
2. BOD Basis of Design
3. Cx Commissioning
4. CIL Construction Issues Log
5. CxA Commissioning Authority
6. CxS Commissioning Specialist
7. CM Construction Manager
8. TCC Temperature Controls Contractor
9. DB/C Design Build Contractor
10. EC Electrical Contractor
11. FOR Field Observation Report

12. FPT Functional Performance Test
13. GC General Contractor
14. IST Integrated Systems Test
15. LEED Leadership in Energy and Environmental Design
16. MFR Manufacturer
17. MC Mechanical Contractor
18. O&M Operation and Maintenance
19. OPR Owner's Project Requirements
20. PC Plumbing Contractor
21. PFC Pre-Functional Checklist
22. Subs Subcontractors to General
23. TAB Test, Adjust & Balance Contractor

1.3 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan (Cx Plan), which is an appendix to this specification, provides definition for the execution of the commissioning process. The Commissioning Authority (CxA) shall update the Cx Plan when appropriate during the Cx process.

B. Commissioning Process. Refer to the Cx Plan for an overview of the typical commissioning tasks during construction and the general order in which they occur.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.

1. Commissioning Plan (Cx Plan)
2. Section 01 78 23 - Operations and Maintenance
3. Section 01 79 00 - Demonstration and Training
4. Section 22 08 00 - Commissioning of Plumbing
5. Section 23 08 00 - Commissioning of HVAC
6. Section 26 08 00 - Commissioning of Electrical

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout, and functional performance testing shall be provided by the Division Contractor. If required, two-way radios, ladders and/or man-lifts shall be provided by the General Contractor or applicable subcontractor.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged shall be replaced. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COORDINATION

A. Refer to the Commissioning Plan in the appendix of this section for further detail on the Commissioning Process.

3.2 EXECUTION

A. The Commissioning Process requires efficient and effective communication among all trades, the design team, the contractors, the vendors, the Owner, and the Commissioning Authority. To facilitate the transition from one activity to the next and to prove system readiness for functional testing; the Commissioning Authority requires documentation showing compliance with the project requirements as well as providing evidence of conformance with manufacturer's recommendations. The following shall be documented and submitted for review and acceptance by the Commissioning Authority in a timely manner for each commissioned piece of equipment or system:

1. Completed pre-functional checklists.
2. Startup reports filled out by a factory authorized representative as required by the project technical specifications.
3. Field quality control test reports as required by the project technical specifications.
4. Building automation system - point to point reports.
5. Testing, adjusting, and balancing reports as required by the project technical specifications.
6. Building automation system graphics.
7. Contractor completed Functional Performance Test documenting that at a minimum one of for each functional test has been completed without deficiency.

B. These documents will be reviewed and accepted by the Commissioning Authority, with concerns and deficiencies tracked in the Construction Issues Log. Commissioning Authority review of these documents is independent of any Architect/Engineer of Record review and approval as required elsewhere in the project technical specifications.

C. Functional Performance Test procedures document conformance with the Owner's project requirements, establish a baseline for equipment and system performance, and are critical tools for troubleshooting by O&M staff during occupancy.

1. The Commissioning Authority will develop the Functional Performance Tests based on the Owner's project requirements, the design construction documents, and approved submittals.
2. The Commissioning Authority will develop DRAFT copies for the Commissioning Team to review and provide comments.
3. The Commissioning Authority will incorporate comments from the team as required and issue FINAL copies that the contractors will implement as required in this section, Paragraph 3.2A.7.
4. The Commissioning Authority will witness and document final Functional Performance Testing per the Commissioning Plan.

5. If Functional Performance Tests fail or deficiencies are found that do not allow the Commissioning Authority to complete the testing, the deficiency will be documented in the Commissioning Actions Log per the Commissioning Plan.

D. In the event functional testing cannot be completed due to Contractor negligence in completing and submitting documentation listed in Paragraph 3.2A or due to Contractor misrepresentation a system is ready for testing, a retesting charge will be submitted by the Commissioning Authority. Retesting charges to satisfactorily complete the Functional Performance Testing shall include labor and reimbursable expenses. These will be assessed to the Owner, wholly transferrable to the General Contractor at the discretion of the Owner.

END OF SECTION

SECTION 01 1100

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements Summary of Work requirements.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Provisions contained in Division 01 apply to Sections of Divisions 03 and 33 of Specifications. Instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, obligations set forth in Contract Documents are obligations of Contractor.

B. Contractor shall furnish total labor, materials, equipment, and services necessary to perform The Work in accordance with Contract Documents.

1.3 WORK OR EQUIPMENT BY OWNER

A. Systems Furniture

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 1200

MULTIPLE CONTRACT SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Multiple Contracts.

1.2 SUMMARY OF CONTRACTS

A. Owner may issue separate contracts for operations scheduled to precede and be substantially completed before beginning of The Work under this Contract.
   1. Contractor will be given written notice from such contractors of any revisions to scheduled completion of their work at least 30 days in advance. Owner will reimburse Contractor for expenses incurred by Contractor by failure to be properly notified.

B. Owner has issued or will issue separate contracts for operations scheduled to be completed between Notice to Proceed and Substantial Completion.
   1. General:
      a. Schedule performance of work covered by such separate contracts in Contractor's Construction Schedule so as to avoid delays in Substantial Completion. Give written notice to such contractors and to Owner of any revisions to scheduled delivery and work dates at least 90 days in advance.
      b. Complete work necessary to accommodate items provided under such separate contracts before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work including, but not limited to, cost of crews during downtime or for call backs and costs to correct substrate deficiencies.
      c. Store and protect completed work provided under separate contracts until date of Substantial Completion.
   2. Testing and Inspection. See Section 01 4523 “Testing and Inspection” for testing and inspection, and testing laboratory services for materials, products, and construction methods:
      a. Aggregate Base. See Section 31 1123.
      b. Duct Testing, Adjusting, and Balancing. See Section 01 4546.
      c. Asphalt Paving. See Section 32 1216.
      d. Concrete. See Section 03 3111.
      e. Flooring Substrate Preparation. See Section 09 0503.
      f. Concrete Paving. See Section 32 1313.
      g. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors. See Section 03 1511.
      h. Fill / Engineering Fill. See Section 31 2323.
      i. Headed Concrete Anchor Studs / Deformed Bar Anchors. See Section 03 1511.
      j. Masonry (Non-structural). Tests and inspections is not required. See Section 04 0501 ‘Common Masonry Requirements’.
      k. Masonry (Structural). Tests and inspections are required as specified in Sections under Heading 04 2200 ‘Unit Masonry’. For administrative requirements, see Section 04 0501 ‘Common Masonry Requirements’.
      l. Reinforcement Bars. See Section 03 2100.
      m. Structural Steel. See Section 05 1223.
      n. Wood Panel Product Sheathing. See Section 06 1636.

C. Owner has issued or will issue separate contracts for operations normally scheduled to follow Substantial Completion.
   1. General:

a. Give written notice to such contractors and to Owner of any revisions of scheduled date of Substantial Completion at least 90 days in advance. Contractor will be back charged for actual expenses incurred by Owner for failure to accurately report date of Substantial Completion.
b. Complete work necessary to accommodate items provided under such separate contracts before Substantial Completion. Contractor will be back charged for actual expenses incurred by Owner for failure to complete such work before Substantial Completion.

2. Furnishings.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 1400

WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Work Restrictions.

1.2 PROJECT CONDITIONS

A. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
   1. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
   2. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project site.
   3. Do not allow use of tobacco in any form on Project Site.
   4. Do not allow pornographic or other indecent materials on site.
   5. Do not allow work on Project site on Saturdays except for emergency work.
   6. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
   7. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
   8. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
   9. Do not build fires on Project Site.
   10. Do not allow weapons on Project Site, except those carried by law enforcement officers or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements to prepare and process Applications for Payments.

1.2 PAYMENT REQUESTS

A. Use Payment Request forms provided by Owner.

B. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.

C. Request Preparation:
   1. Complete every entry on Payment Request form.
   2. Entries will match data on approved schedule of values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
   3. Submit signed Payment Request to Architect with current Construction Schedule.

D. Comply with the San Bernardino County's General Conditions, Application for Payment requirements.

E. Comply with the San Bernardino County's General Conditions, Final Completion and Final Payment requirements.

1.3 SCHEDULE OF VALUES

A. Submit schedule of values on Owner's standard form to owner within 14 days after date of commencement. Coordinate preparation of schedule of values with preparation of Contractor's Construction Schedule. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:
   1. Contractor's Construction Schedule.
   2. Payment Request form.
   3. Schedule of Allowances.
   4. Schedule of Alternates.

B. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Project Management and Coordination on Projects.

1.2 PROJECT COORDINATION

A. Project designation for this Project is: **San Bernardino County Animal Care Center**

B. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.

1.3 MULTIPLE CONTRACT COORDINATION

A. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.

B. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.

C. Contractor shall be responsible for providing Construction Waste Management And Disposal services for those who perform work on Project from Notice to Proceed to date of Substantial Completion.

D. Contractor shall be responsible for Final Cleaning for entire Project.

1.4 PROJECT MEETINGS AND CONFERENCES

A. Preconstruction Conference:
   1. Attend preconstruction conference and organizational meeting scheduled by Architect at Project site or other convenient location.
   2. Be prepared to discuss items of significance that could affect progress, including such topics as:
      a. Construction schedule.
      b. Critical Work sequencing.
      c. Current problems.
      d. Designation of responsible personnel.
      e. Distribution of Contract Documents.
      f. Equipment deliveries and priorities.
      g. General schedule of inspections by Architect and its consultants.
      h. General inspection of tests.
      i. Office, work, and storage areas.
      j. Preparation of record documents and O & M manuals.
      k. Procedures for processing interpretations and Modifications.
      l. Procedures for processing Payment Requests.
      m. Project cleanup.
      n. Security.
      o. Status of permits.
      p. Submittal of Product Data, Shop Drawings, Samples, Quality Assurance / Control submittals.

q. Work restrictions.
r. Working hours.

B. Progress Meetings:
1. Attend progress meetings at Project site at regularly scheduled intervals determined by Architect, at least once a month.
2. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
3. Be prepared to discuss items of significance that could affect progress, including following:
a. Progress since last meeting.
b. Whether Contractor is on schedule.
c. Activities required to complete Project within Contract Time.
d. Labor and materials provided under separate contracts.
e. Off-site fabrication problems.
f. Access.
g. Site use.
h. Temporary facilities and services.
i. Hours of work.
j. Hazards and risks.
k. Project cleanup.
l. Quality and Work standards.
m. Status of pending modifications.
n. Documentation of information for Payment Requests.
o. Maintenance of Project records.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1.2 SCHEDULING OF WORK

A. Bar Chart Schedule:
   1. Submit horizontal bar chart schedule before Preconstruction Conference. Provide separate time bar for each construction activity listed on Owner's payment request form. Within each time bar, show estimated completion percentage. Provide continuous vertical line to identify first working day of each week. Show each activity in chronological sequence. Show graphically sequences necessary for completion of related portions of The Work. As The Work progresses, place contrasting mark in each bar to indicate actual completion.
   2. Provide copies of schedule for Architect and Owner and post copy in field office.
   3. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

B. Network Analysis Schedule:
   1. General Requirements:
      a. Submit and maintain Critical Path Method (CPM) schedule for the Work. Computerized network diagram will serve as 'Master Construction Schedule' for Project, giving mathematical analysis (printout) of that network, which verifies and validates logic and planning and defines critical path. Display accepted schedule in site construction office at all times.
      b. Utilize CPM schedule for planning, organizing, and directing the Work, for reporting progress, and for requesting payment for work completed. Review schedule each month in progress meeting.
      c. Clearly explain abbreviations used in CPM schedules in legend of symbols, either separate or attached.
   2. Schedule Requirements:
      a. CPM schedule will clearly show sequential interdependencies, with activity duration and float clearly represented. Sequence(s) of activities with no float will be clearly identified as Critical Path(s).
      b. Scheduling system will be capable of baseline comparison analysis. Upon development and acceptance of schedule, 'freeze' initial schedule as baseline schedule. As work progresses, provide graphics displaying actual progress bars versus baseline or target bars.
      c. Activity durations will be in workdays.
      d. Activity Content:
         1) CPM schedule will include but not be limited to following activities as they apply to Project.
            a) Construction tasks (Maximum 20 day duration for any activity).
            b) Shop drawings submittal and approval process.
            c) Ordering, fabrication, and delivery of major materials and equipment.
            d) Checkout, start-up, and test and balance of major equipment.
            e) Submittals of record drawings and maintenance manuals.
            f) Cleanup and punch out tasks.
            g) Critical coordination activities required to insure timely support and inspections.
            h) Owner purchased/installed items and Owner's separate contract work.

i) Pre-final, final inspections and substantial completion.
j) Final payment.
k) Owner occupancy.

2) Schedule submittal activities to allow sufficient time for work to be procured and installed, even if submittal is unacceptable and re-submittal is required.

3. Submittals:
   a. Submit initial submittal, complete revisions, and periodic reports in three hard copies, one reproducible and two prints or plots, and one copy on CD.
   b. Submit completed network program consisting of PERT, GANTT, and mathematical analysis prior to preconstruction meeting.
   c. Review development status of network CPM schedule with Owner and Architect during preparation period.
4. Report Formats:
   a. Standard set of reports submitted each month including initial submittals will consist of following:
      1) Graphics:
         a) GANTT chart of entire project. Progress bar chart will include target or baseline comparison bars. Bar positions will be early start / early finish with float clearly defined.
         b) Time-scaled logic diagram or time-scaled network, also called PERT chart, with critical path clearly defined.
         c) PERT and GANTT charts will include tabulation of each activity. Furnish following information for each activity on PERT and GANTT charts. Sequencing of columns on GANTT chart will match following:
         d) GANTT Chart Column Layout:
            (1) Activity / Task Description.
            (2) Estimated duration of activity / task.
            (3) Start status.
            (4) Status.
            (5) Start date by calendar date.
            (6) End date by calendar date.
            (7) Latest start date by calendar date.
            (8) Latest end date by calendar date.
            (9) Total slack or float time in calendar days.
            (10) Percentage of activity achieved.
         e) Program or means used in making mathematical computation will compile total value of completed and partially completed activities. Program will also accept revised completion dates as modified by Change Order time adjustments and accompanying re-computations of float dates.
         f) PERT Chart Box Layout:
            (1) Task / Activity Name.
            (2) Duration.
            (3) Start Date.
            (4) End Date.
            (5) Status (critical task).
   b. Graphics outlined above will comply with following criteria unless noted otherwise:
      1) Sheet size of diagram will be 24 by 36 inches minimum and time scaled in weeks unless approved otherwise.
      2) On each page include title block containing as minimum following information:
         a) Project Title.
         b) Project Number.
         c) Contractor's Business Name.
         d) Date of Submittal and/or Revision.
         e) Progress Computation Date.
         f) Legend of Symbols and Abbreviations as applicable.
      3) Prepare and submit to Architect upon request additional charts, reports, and current copy on disk of Project program.
5. CPM Schedule Implementation And Monitoring:
   a. Where Contractor is shown to be behind schedule, provide accompanying written summary, cause, and explanation of planned remedial action.

1) CPM schedules will reflect those instances, Modifications or other alterations to schedule, which have impact on final completion or interim target dates within schedule.
2) Owner may withhold payments or portions of payments upon failure to maintain scheduled progress of the Work as shown on accepted CPM schedule.

b. Float time belongs to Project, not to Contractor or to Owner, and may be utilized by both parties.

6. Schedule Changes And Updates:
   a. Update CPM Schedule prior to each submittal to Owner and Architect. Correlate Schedule of Values graphically with CPM schedule for evaluation of monthly Payment Request.
   b. Include additional activities added to CPM schedule by Contractor submitted schedule charts. It is Owner's intent that Project be managed and operated by CPM schedule.

C. Daily Construction Reports:
1. Prepare daily reports of operations at Project including at least following information:
   a. List of Subcontractors at site.
   b. Approximate count of personnel at site by trade.
   c. High and low temperatures, general weather conditions.
   d. Major items of equipment on site.
   e. Materials, equipment, or Owner-furnished items arriving at or leaving site.
   f. Accidents and unusual events.
   g. Site or structure damage by water, frost, wind, or other causes.
   h. Meetings, conferences, and significant decisions.
   i. Visitors to the job including meeting attendees.
   j. Stoppages, delays, shortages, losses.
   k. Any tests made and their result if known.
   l. Meter readings and similar recordings.
   m. Emergency procedures.
   n. Orders and requests of governing authorities.
   o. Modifications received, carried out.
   p. Services connected, disconnected.
   q. Equipment or system tests and start-ups.
   r. Brief summary of work accomplished that day.
   s. Signature of person preparing report.
2. Submit daily reports to Architect at least weekly.
3. Maintain copies of daily reports at field office.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Submittal Procedures.

1.2 SUBMITTAL SCHEDULE

A. Furnish submittal schedule within 5 days after receipt of Notice to Proceed, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational submittals.
   1. Coordinate submittal schedule with Contractor's construction schedule.
   2. Enclose the following information for each item:
      a. Scheduled date for first submittal.
      b. Related Section number.
      c. Submittal category.
      d. Name of Subcontractor.
      e. Description of part of the Work covered.
      f. Scheduled date for resubmittal.
      g. Scheduled date for Architect's final release or approval.

B. Print and distribute copies to Architect and Owner and post copy in field office. When revisions are made, distribute to same parties and post in same location.

C. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

1.3 SUBMITTAL PROCEDURES

A. Coordination:
   1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
      a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
      b. Coordinate transmittal of different types of submittals required for related elements of The Work so processing will not be delayed by need to review submittals concurrently for coordination. Architect reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
   2. Processing Time:
      a. Allow sufficient review time so installation will not be delayed by time required to process submittals, including time for resubmittals.
         1) Allow 7 days for initial review. Allow additional time if processing must be delayed to allow coordination with subsequent submittals. Architect will promptly advise Contractor when submittal being processed must be delayed for coordination.
         2) If an intermediate submittal is necessary, process same as initial submittal.
         3) Allow 10 days for reprocessing each submittal.
         4) No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.

3. Identification:
   a. Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
      1) Provide space approximately 4 by 5 inches on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
      2) Include following information on label for processing and recording action taken:
         a) Project name.
         b) Date.
         c) Name and address of Architect.
         d) Name and address of Contractor.
         e) Name and address of Subcontractor.
         f) Name and address of supplier.
         g) Name of manufacturer.
         h) Number and title of appropriate Specification Section.
         i) Drawing number and detail references, as appropriate.
4. Transmittal:
   a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
   b. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Submit Product Data, as required by individual Sections of Specifications.
   2. Mark each copy of each set of submittals to show choices and options used on Project. Where printed Product Data includes information on products that are not required for Project, mark copies to indicate information relating to Project.
   3. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
   4. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.

B. Shop Drawings:
   1. Submit newly prepared graphic data to accurate scale. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 36 by 48 inches (915 by 1 200 mm). Highlight, encircle, or otherwise show deviations from Contract Documents. Include following information as a minimum:
      a. Dimensions.
      b. Identification of products and materials included.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
   2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings. Standard printed information prepared without specific reference to Project is not acceptable as Shop Drawings.
   3. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit to Architect six copies of shop drawings required by Contract Documents. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.

C. Samples:
   1. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

a. Mount, display, or package Samples so as to ease review of qualities specified. Prepare Samples to match samples provided by Architect, if applicable. Include following:
   1) Generic description of Sample.
   2) Sample source.
   3) Product name or name of manufacturer.
   4) Compliance with recognized standards.
   5) Availability and delivery time.

2. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
   a. Where variations in color, pattern, texture or other characteristics are inherent in material or product represented, submit set of three samples minimum that show approximate limits of variations.
   b. Refer to other specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
   c. Refer to other Sections for Samples to be returned to Contractor for incorporation into The Work. Such Samples shall be undamaged at time of use. On transmittal, indicate special requests regarding disposition of Sample submittals.
3. Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
4. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
5. Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
   a. Unless noncompliance with Contract Documents is observed, submittal may serve as final submittal.
   b. Sample sets may be used to obtain final acceptance of construction associated with each set.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3500

SPECIAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Special Procedures.

1.2 ACCELERATION OF WORK

A. Complete The Work in accordance with Construction Schedule. If Contractor falls behind schedule, take such actions as are necessary, at no additional expense to Owner, to bring progress of The Work back in accordance with schedule.

B. Owner may request proposal for completion of The Work at date earlier than expiration of Contract Time. Promptly provide requested proposal showing cost of such acceleration of The Work. Consult with Owner and Architect regarding possible options to decrease cost of such acceleration. If Owner determines to order acceleration of The Work, change in Contract Sum and Contract Time resulting from acceleration will be included in a Change Order.

1.3 OWNER'S SAFETY REQUIREMENTS

A. Personal Protection:
   1. Contractor shall ensure:
      a. Positive means of fall protection, such as guardrails system, safety net system, personal fall arrest system, etc, is provided to employees whenever exposed to a fall six feet or more above a lower level.
      b. Personnel working on Project shall wear hard hats and safety glasses as required by regulation and hazard.
      c. Personnel working on Project shall wear long or short sleeve shirts, long pants, and hard-toed boots or other sturdy shoes appropriate to type and phase of work being performed.

B. Contractor Tools And Equipment:
   1. Contractor shall ensure:
      a. Tools and equipment are in good working condition, well maintained, and have necessary guards in place.
      b. Ground Fault Circuit Interrupters (GFCI) is utilized on power cords and tools.
      c. Scaffolding and man lifts are in good working condition, erected and maintained as required by governmental regulations.
      d. Ladders are in good condition, well maintained, used as specified by Manufacturer, and secured as required.

C. Miscellaneous:
   1. Contractor shall ensure:
      a. Protection is provided on protruding rebar and other similar objects.
      b. General Contractor Superintendent has completed the OSHA 10-hour construction outreach training course or equivalent.
      c. Implementation and administration of safety program on Project.
      d. Material Safety Data Sheets (MSDS) are provided for substances or materials for which an MSDS is required by governmental regulations before bringing on site.
      e. Consistent safety training is provided to employees on Project.

f. Implement and coordinate Lockout / Tagout procedures with Owner's Representative as required.

2. Report accidents involving injury to employees on Project that require off-site medical treatment to Owner's designated representative.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are used to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
   1. Specific quality assurance and quality control requirements for individual construction activities are specified in Sections that specify those activities and Section 01 4523. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality control procedures that facilitate compliance with Contract Document requirements.
   3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:
   1. Section 01 3100: 'Project Management and Coordination' for Pre-Installation Conferences for testing and inspection.
   2. Section 01 3200: 'Construction Progress Documentation' for developing a schedule of required tests and inspections.
   3. Section 01 3300: 'Submittal Procedures'.
   4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
   5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   6. Section 01 7300: 'Executions' for cutting and patching for repair and restoration of construction disturbed by testing and inspecting activities.
   7. Divisions 01 thru 49 establish responsibility for providing specific testing and inspections.

1.3 REFERENCES

A. Association Publications:
   1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15th St., NW, Washington, DC 20005; 202-347-7474; www.acec.org).
   2. International Code Council (IBC):
      a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
   3. The American Institute of Architects. AIA Document A201, *General Conditions of the Contract for Construction*. Washington, DC. 2007.
   4. The Construction Specifications Institute. Project Resource Manual/CSI Manual of Practice, 5th *Edition*. New York, McGraw-Hill, 2005.

B. Definitions:
1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
2. Approved: To authorize, endorse, validate, confirm, or agree to.
3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
4. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.
5. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
6. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    a. Inspection: Not required by code provisions but may be required by Contract Documents.
    b. Special Inspection: Required by code provisions and by Contract Documents.
    c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
7. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
    a. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
8. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish standard by which the Work will be judged.
9. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
10. Owner’s Representative: Owner’s Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner’s approval or authorization.
11. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
12. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
13. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
14. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
15. Service Provider: Agency or firm qualified to perform required tests and inspections.
16. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
17. Special Inspection: See Inspection.

18. Special Inspector: Certified individual or firm that implements special inspection program for project.
19. Special Test: See Test.
20. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    a. Test: Not required by code provisions but may be required by Contract Documents.
    b. Special Test: Required by code provisions and by Contract Documents.
21. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
22. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
23. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: Quantity or quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements. Refer uncertainties to Architect for decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: Testing Agency to demonstrate their capabilities and experience per Article 1.7 “Quality Assurance”.

B. Schedule of Tests and Inspections: Prepare in tabular form and include following:
1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.

C. Certified written reports of each inspection, test, or similar service will include, but not be limited:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of Testing Agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

1.6 QUALITY ASSURANCE

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to verify compliance and guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Activities performed by Owner's Quality Assurance Testing Agency include, but are not limited to following:
   1. Preconstruction:
      a. Review inspection requirements.
      b. Review inspection frequency.
      c. Review concrete mix design submittals.
      d. Review other material submittals.
      e. Review contractor's welding certificates.
      f. Prepare non-compliance log to track non-compliant testing or inspections.
      g. Review Quality Assurance personnel qualifications.
   2. Fill / Engineered Fill:
      a. Review Quality Assurance coverage of earthwork required observation and testing.
      b. Provide periodic Quality Assurance testing to confirm accuracy of Quality Assurance test reports.
      c. Review Quality Assurance testing and observation reports.
      d. Review Quality Assurance personnel qualifications.

1.7 QUALITY CONTROL

A. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements performed by Contractor. They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.
   1. Where services are indicated as Contractor's responsibility, engage a qualified Testing Agency to perform these quality control services.
      a. Contractor shall not employ same testing entity engaged by Owner, without Owner's written approval.

B. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified Testing Agency to conduct special tests and inspections required by authorities having jurisdiction as responsibility of Owner, and as follows:
   1. Requirements of Section 01 4523: "Testing and Inspecting Services" apply.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with Contract Document requirements for Section 01 7300 “Execution” for Cutting and Patching.

B. Protect construction exposed by or for Quality Assurance and Quality Control activities.

C. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

END OF SECTION

SECTION 01 4200

REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Reference standards, definitions, specification format, and industry standards.

1.2 REFERENCES

A. Definitions:
   1. Approved: The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
   2. Directed: The term "directed" is a command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," and "permitted" have the same meaning as "directed."
   3. Experienced: The term "experienced," when used with an entity, means having successfully completed a minimum often previous projects similar in size and scope to this Project; being familiar with the special requirements indicated, and having complied with requirements of authority having jurisdiction.
   4. Furnish: The term "furnish" means supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
   5. General: Basic Contract definitions are included in the Conditions of the Contract.
   6. Indicated: The term "indicated" refers to requirements expressed by graphic representations, or in written form on Drawings, in Specifications, and in other Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
   7. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
   8. Installer: An "Installer" is the Contractor, or another entity engaged by the Contractor, as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   9. Project Site: The term "Project site" means the space available for performing construction activities. The extent of the Project site is shown on the Drawings and mayor may not be identical with the description of the land on which the Project is to be built.
   10. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.
   11. Regulations: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
   12. Submitted: The terms "submitted," "reported," "satisfactory" and similar words and phrases means submitted to Architect, reported to Architect and similar phrases.
   13. Testing Agencies: A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, or to report on and, if required, to interpret results of those inspections or tests.
   14. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

B. References Standards:

1. Specification Format: Specifications will follow MasterFormat™ 2004 for organizing numbers and titles. (The Construction Specifications Institute, Project Resource Manual/CSI Manual of Practice, 5th *Edition*. New York, McGraw-Hill, 2005).
   a. Specification Identifications:
      1) The Specifications use section numbers and titles to help cross referencing in the Contract Documents.
      2) Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
   b. Specification Language:
      1) Specifications should be prepared, with concern and respect for their legal status. Specifications should be Clear, Concise, Correct and Complete.
      2) Streamlining: Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference
   c. Sentence Structure:
      1) Specifications to be written in the “Imperative Mood”.
         a) The verb that clearly defines the action becomes the first word in the sentence.
         b) The imperative sentence is concise and readily understandable.
      2) Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference.
   d. Abbreviated Language:
      1) Abbreviations should be used only on drawings and schedules where space is limited.
      2) Abbreviations with multiple meanings should be avoided, unless used in different disciplines where their meaning is clear from the context in which they are used.
      3) Abbreviations should be limited to five or fewer letters
         a) The verb that clearly defines the action becomes the first word in the sentence.
   e. Symbols:
      1) Caution should apply to symbols substituted for words or terms.
   f. Numbers:
      1) The use of Arabic numerals rather that words for numbers is recommended.

C. Industry Standards:
   1. Except where Contract Documents specify otherwise, construction industry standards will apply and are made a part of Contract Documents by reference.
   2. Where compliance with two or more standards is specified and standards apparently establish different or conflicting requirements for minimum quantities or quality levels, refer to Architect for decision before proceeding. Quantity or quality level shown or specified will be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.
   3. Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents. Where copies of standards are needed for performance of a required construction activity, Contractor will obtain copies directly from publication source.
   4. Trade Association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean association names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AABC	Associated Air Balance Council	Washington	DC	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers Association	Schaumburg	IL	(847) 303-5664	www.aamanet.org
AASHTO	American Association of State Highway & Transportation Officials	Washington	DC	(202) 624-5800	www.aashto.org

AAMA	American Architectural Manufacturers Association	Schamumburg	IL	(847) 303-5774	www.aamanet.org
AASHTO	American association of State Highways and Transportation Officials	Washington	DC		www.transportation.org www.aashto.org
ACI	American Concrete Institute International	Farmington Hills	MI	(248) 848-3700	www.aci-int.org
AGA	American Gas Association	Washington	DC	(202) 824-7000	www.aga.org
AHRI	Air Conditioning Heating & Refrigeration Institute	Arlington	VA	(703) 524-8800	www.ari.org
AIA	American Institution of Architects	Washington	DC	(202) 626-7300	www.aia.org
AISC	American Institute of Steel Construction	Chicago	IL	(312) 670-2400	www.aisc.org
AISI	American Iron & Steel Institute	Washington	DC	(202) 452-7100	www.steel.org
AITC	American Institution of Timber Construction	Englewood	CO	(303) 792-9559	www.aitc-glulam.org
AMCA	Air Movement & Control Association International	Arlington Heights	IL	(847) 394-0150	www.amca.org
ANSI	American National Standards Institute	New York	NY	(212) 642-4900	www.ansi.org
APA	APA-Engineered Wood Association	Tacoma	WA	(253) 565-6600	www.apawood.org
API	American Petroleum Institute	Washington	DC	(202) 682-8000	www.api.org
AQMD	South Coast Air Quality Management District	Diamond Bar	CA	(909) 396-2000	www.aqmd.gov
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers	Atlanta	GA	(404) 636-8400	www.ashrae.org
ASME	American Society of Mechanical Engineers International	New York	NY	(800) 843-2763	www.asme.org
ASTM	ASTM International	West Conshohocken	PA	(610) 832-9500	www.astm.org
AWI	Architectural Woodwork Institute	Potomac Falls	VA	(571) 323-3636	www.awinet.org
AWPA	American Wood Protection Association	Birmingham	AL	(205) 733-4077	www.awpa.com
AWS	American Welding Society	Miami	FL	(800) 443-9353	www.aws.org
AWWA	American Water Works Assoc	Denver	CO	(303) 794-7711	www.awwa.org
BHMA	Builders Hardware Manufacturers Association	New York	NY	(212) 297-2122	www.buildershardware.com
BIA	Brick Industry Association	Reston	VA	(703) 620-0010	www.bia.org
CFI	International Certified Floorcovering Installers, Inc.	Kansas City	MO	(816) 231-4646	www.cfi-installers.org
CRI	Carpet & Rug Institution	Dalton	GA	(706) 278-3176	www.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute	Schaumburg	IL	(847) 517-1200	www.crsi.org
CISPI	Cast Iron Soil Pipe Institute	Chattanooga	TN	(423) 892-0137	www.cispi.org
DHI	Door & Hardware Institute	Chantilly	VA	(703) 222-2010	www.dhi.org
DIPRA	Ductile Iron Pipe Research Association.	Birmingham	AL	(205) 402-8700	www.dipra.org
EIMA	EIFS Industry Members Association	Morrow	GA	(800) 294-3462	www.eima.com
FM	FM Global	Johnston	RI	(401) 275-3000	www.fmglobal.com

FSC	Forest Stewardship Council	Bonn, Germany		+49 (0) 228 367 66 0	www.fsc.org
GA	Gypsum Association	Hyattsville	MD	(301) 277-8686	www.gypsum.org
GS	Green Seal	Washington	DC	(202) 872-6400	www.greenseal.org
HPVA	Hardwood Plywood & Veneer Association	Reston	VA	(703) 435-2900	www.hpva.org
ICC	International Code Council	Washington	DC	(888) 422-7233	www.iccsafe.org
ICC-ES	ICC Evaluation Service	Whittier	CA	(562) 699-0543	www.icc-es.org
ICBO	International Conference of Building Officials				(See ICC)
ISO	International Organization for Standardization	Geneva, Switzerland			www.iso.org
ISSA	International Slurry Surfacing Association	Annapolis	MD	(410) 267-0023	www.slurry.org
KCMA	Kitchen Cabinet Manufactures Association	Reston	VA	(703) 264-1690	www.kcma.org
LPI	Lightning Protection Institute	Maryville	MO	(800) 488-6864	www.lightning.org
MFMA	Maple Flooring Manufacturers' Association	Deerfield	IL	(888) 480-9138	www.maplefloor.org
MSS	Manufacturer's Standardization Society of The Valve and Fittings Industry	Vienna	VA	(703) 281-6613	www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers	Glen Ellyn	IL	(630) 942-6591	www.naamm.org
NEC	National Electric Code	(from NFPA).			
NEMA	National Electrical Manufacturer's Association	Rosslyn	VA	(703) 841-3200	www.nema.org
NFPA	National Fire Protection Association	Quincy	MA	(800) 344-3555	www.nfpa.org
NFRC	National Fenestration Rating Council	Greenbelt	MD	(301) 589-1776	www.nfrc.org
NSF	NSF International	Ann Arbor	MI	(734) 769-8010	www.nsf.org
PCA	Portland Cement Association	Skokie	IL	(847) 966-6200	www.cement.org
PCI	Precast / Prestressed Concrete Institute	Chicago	IL	(312) 786-0300	www.pci.org
PEI	Porcelain Enamel Institute	Norcross	GA	(770) 676-9366	www.porcelainenamel.com
RFCI	Resilient Floor Covering Institute	LaGrange	GA	(706) 882-3833	www.rfci.com
SCTE	Society of Cable Telecommunications Engineers	Exton	PA	(800) 542-5040	www.scte.org
SDI	Steel Deck Institute	Fox River Grove	IL	(847) 458-4647	www.sdi.org
SDI	Steel Door Institute	Westlake	OH	(440) 899-0010	www.steeldoor.org
SIGMA	Sealed Insulating Glass Manufacturer's Association	Chicago	IL	(312) 644-6610	www.arcat.com
SJI	Steel Joist Institute	Myrtle Beach	SC	(843) 293-1995	www.steeljoist.org
SMACNA	Sheet Metal & Air Conditioning Contractors National Association	Chantilly	VA	(703) 803-2980	www.smacna.org
SPIB	Southern Pine Inspection Bureau	Pensacola	FL	(850) 434-2611	www.spib.org
SSMA	Steel Stud Manufacturer's Association	Glen Ellyn	IL	(630) 942-6592	www.ssma.com
TCNA	Tile Council of North America	Anderson	SC	(864) 646-8453	www.tileusa.com
TPI	Truss Plate Institute	Alexandria	VA	(703) 683-1010	www.tpinst.org

TPI	Turfgrass Producers International (formally American Sod Producers Association)	East Dundee	IL	(847) 649-5555	www.turfgrasssod.org
UL	Underwriters Laboratories	Camas	WA	(877) 854-3577	www.ul.com
WDMA	Window and Door Manufacturer's Association	Chicago	IL	(312) 321-6802	www.nwwda.org
WWPA	Western Wood Products Association	Portland	OR	(503) 224-3930	www.wwpa.org

D. Federal Government Agencies:
1. Names and titles of federal government standard or specification producing agencies are often abbreviated. Following acronyms or abbreviations referenced in Contract Documents represent names of standard or specification producing agencies of federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

CS	Commercial Standard (U S Department of Commerce)	Washington	DC	(202) 512-0000	www.doc.gov
EPA	Environmental Protection Agency	Washington	DC	(202) 272-0167	www.epa.gov
FCC	Federal Communications Commission	Washington	DC	(888) 225-5322	www.fcc.gov
FS	Federal Specifications Unit (Available from GSA)	Washington	DC	(202) 619-8925	www.gsa.gov
MIL	Military Standardization Documents (U S Department of Defense)	Philadelphia	PA	(215) 697-2179	www.dod.gov
NIST	National Institute of Standards and Technology, technology Administration (US Department of Commerce)	Gaithersburg	MD	(301) 975-4500	www.ts.nist.gov
OSHA	Occupational Safety & Health Administration (U S Department of Labor)	Washington	DC	202) 219-8148	www.osha.gov
PS	Product Standard of NBS (U S Department of Commerce)	Washington	DC	(202) 512-1800	www.doc.gov

E. Governing Regulations / Authorities:
1. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
2. Obtain copies of regulations required to be retained at Project Site, available for reference by parties who have a reasonable need for such reference.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4301

QUALITY ASSURANCE - QUALIFICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
   1. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Requirements:
   1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.

1.2 REFERENCES

A. Definitions:
   1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
   2. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
   3. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
   4. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.

B. Reference Standards:
   1. ASTM International:
      a. ASTM E329-11a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'

1.3 QUALIFICATIONS

A. Qualifications: Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
   1. Testing Agency Qualifications:
      a. Independent Testing Agency with experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
         1) Testing Laboratory:
            a) AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
            b) Cement and Concrete Reference Laboratory (CCRL).
            c) Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
            d) National Voluntary Laboratory (NVLAP): Testing Agency accredited according to National Institute of Standards and Technology (NIST) Technology Administration, U. S. Department of Commerce Accreditation Program.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4523

TESTING AND INSPECTING SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes testing, inspections, and testing laboratory services for materials, products, and construction methods as specified hereafter for the Work.

B. Specified tests, inspections, and related actions do not limit Contractor's quality control procedures to fully comply with Contract Document requirements in all regards.

C. Costs: Costs of initial services for testing and inspection personnel will be paid by Owner unless otherwise noted.
   1. If initial tests indicate non-compliance with contract document requirements, any subsequent testing will be performed by same personnel and paid for by Contractor.

D. Related Requirements:
   1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
   2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
   3. Division 01 through Division 50 establish responsibility for providing specific testing and inspections and Field Tests and Inspections.

1.3 REFERENCES

A. Definitions:
   1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
   2. Approved: To authorize, endorse, validate, confirm, or agree to.
   3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
   4. Experienced: When used with an entity, "experienced" means having successfully completed minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.
   5. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
   6. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
      a. Inspection: Not required by code provisions but may be required by Contract Documents.
      b. Special Inspection: Required by code provisions and by Contract Documents.
      c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.

d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.

7. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
8. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
9. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
10. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
11. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
12. Relative Compaction: Ratio of field dry density as determined by ASTM D6938 or ASTM D2216, and laboratory maximum dry density as determined by ASTM D1557.
13. Service Provider: Agency or firm qualified to perform required tests and inspections.
14. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
15. Special Inspection: See Inspection.
16. Special Inspector: Certified individual or firm that implements special inspection program for project.
17. Special Test: See Test.
18. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    a. Test: Not required by code provisions but may be required by Contract Documents.
    b. Special Test: Required by code provisions and by Contract Documents.
19. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
20. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
21. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

B. Reference Standards:
1. ASTM International:
    a. ASTM C1021-08, 'Standard Practice for Laboratories Engaged in Testing of Building Sealants'.
    b. ASTM C1077-11c, 'Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation'.
    c. ASTM C1093-11, 'Standard Practice for Accreditation of Testing Agencies for Masonry.
    d. ASTM D3666-11, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
    e. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
    f. ASTM E329-11c: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
    g. ASTM E543-09, 'Standard Specification for Agencies Performing Nondestructive Testing'.
    h. ASTM E1212-09, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.

1.4 SUBMITTALS

A. Informational Submittals:
1. General: Additional submittal requirements are specified in Individual Sections in Division 01 through Division 50.

2. Certificates:
   a. Testing Agency will submit certified written report of each inspection, test, or similar service.
3. Tests and Evaluation Reports:
   a. Testing Agency or Agencies will prepare logs, test reports, and certificates applicable to specific tests and inspections and deliver copies (or electronic record) distributed as follows:
      1) 1 copy to Owner's Representative.
      2) 1 copy to Architect.
      3) 1 copy to Consulting Engineers (Engineer of Record).
      4) 1 copy to General Contractor.
      5) 1 copy to Authorities Having Jurisdiction (if required).
   b. Other tests, certificates, and similar documents will be obtained by Contractor and delivered to Owner's Representative and Architect in such time as not to delay progress of the Work or final payment therefore.
4. Source Quality Control Submittals:
   a. Testing Agency will submit following prior to commencing the Work:
      1) Qualifications of Testing Agency management and personnel designated to project.
      2) Testing Agency 'Written Practice for Quality Assurance'.
      3) Qualification records for Inspector and non-destructive testing technicians designated for project.
      4) Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
      5) Testing Agency Quality Control Plan for monitoring and control of testing operations.
      6) Welding Inspection Procedures (Structural Steel testing).
      7) Bolting Inspection Procedures (Structural Steel testing).
      8) Shear Connector Stud Inspection Procedures (Structural Steel testing).
      9) Seismic Connections Inspection Procedures (Structural Steel testing).

1.5 QUALITY ASSURANCE

A. Owner or Owner's designated representative(s) will perform quality assurance. Owner's quality assurance procedures may include observations, inspections, testing, verification, monitoring and any other procedures deemed necessary by Owner to verify compliance with Contract Documents.

B. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.

C. Certification: Product producers and associations, which have instituted approved systems of quality control and which have been approved by document approval agencies, are not required to have further testing. Concrete mixing plants, plants producing fabricated concrete and wood or plywood products certified by agency, lumber, plywood grade marked by approved associates, and materials or equipment bearing underwriters' laboratory labels require no further testing and inspection.

D. Written Practice for Quality Assurance: Testing Agency will maintain written practice for selection and administration of inspection personnel, describing training, experience, and examination requirements for qualification and certification of inspection personnel. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.

1.6 QUALITY CONTROL

A. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing, coordination, start-up, operational checkout, and commissioning of all items of the Work included in Project. All costs for these services will be included in Contractor's cost of the Work.

B. Contractor will assign one employee to be responsible for Quality Control. This individual may have other responsibilities and may be Contractor's Project superintendent or Contractor's Project Manager.

C. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and Owner's Representative within twenty four (24) hours of test or inspection having been performed.
   1. Testing and Inspection Reports will be distributed as follows:
      a. 1 copy to Owner's Representative.
      b. 1 copy to Architect.
      c. 1 copy to Consulting Engineer(s) (Engineer of Record).
      d. 1 copy to Authorities Having Jurisdiction (if required).

1.7 TESTS AND INSPECTIONS - GENERAL

A. Testing specifically identified to be conducted by Owner, will be performed by an independent entity and will be arranged and paid for by Owner.

B. Individual Sections in Division 01 through Division 50 indicate if Owner will provide testing and inspection of the Work of that Section.

C. Owner may engage additional consultants for testing, air balancing, commissioning, or other special services. Activities of any such Owner consultants are in addition to Contractor testing of materials or systems necessary to prove that performance is in compliance with Contract requirements. Contractor must cooperate with persons and firms engaged in these activities.

D. Tests include but not limited to those described in detail in 'Field Quality Control' in Part 3 of Individual Sections in Divisions 01 through Division 50.

E. Taking Specimens:
   1. Except as may be specifically otherwise approved by Architect, only testing laboratory shall secure, handle, transport, or store any samples and specimens for testing.

F. Scheduling Testing Agency:
   1. Contractor will coordinate the Work and facilitate timeliness of such testing and inspecting services so as not to delay the Work.
   2. Contractor will notify Testing Agency and Architect to schedule tests and / or inspections.
      a. Architect will notify Owner's Representative before each test and / or inspection.

G. For 'building-wide' and/or life safety systems, such as emergency lighting, emergency power uninterruptible power supply systems, fire alarm, fire sprinkler systems, smoke evacuation systems, toxic gas monitoring, capturer exhaust systems, etc. formal start-up inspection will be completed prior to requesting Substantial Completion Inspection for any area of Project:
   1. Manufacturer's representatives and installing contractor will demonstrate both operation and compliance to Owner's agents and consultants. If coordinated and scheduled appropriately by Contractor, these equipment and/or systems inspections may also serve to provide required Owner training, if approved in advance by Owner.
   2. Contractor responsible for requesting that Architect arrange for inspection of materials, equipment, and work prior to assembly or enclosure that would make materials, equipment, or work inaccessible for inspection and at other times as may be required.

1.8 ARCHITECT'S RESPONSIBILTY

A. Architect Duties:
   1. Notify Owner's Representative before each test and/or inspection.

1.9 CONTRACTOR'S RESPONSIBILITY

A. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.

B. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.

C. Cooperate with Testing Agency(s) performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify Testing Agency before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:
   1. Providing access to the Work and furnishing incidental labor, equipment, and facilities deemed necessary by Testing Agency to facilitate inspections and tests at no additional cost to Owner.
   2. Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
   3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
   4. Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.

D. Contractor will integrate Owner's independent Testing Agency services within Baseline Project Schedule and with other Project activities.

E. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.

F. All Work is subject to testing and inspection and verification of correct operation prior to 100% payment to Contractor of line item(s) pertaining to that aspect of the Work.

G. For Mechanical Equipment, inspection and documented approval of individual equipment and/or system(s) must be accomplished prior to requesting Substantial Completion Inspection for any area affected by said equipment and/or system.
   1. Contractor will perform thorough checkout of operations with manufacturer's representatives prior to requesting formal inspection by Owner. Contractor must notify Owner's Representative, in advance, as to when manufacturer's representative is scheduled to arrive at Site.

H. Comply:
   1. Upon completion of Testing Agency's inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
   2. Comply with Contract Documents in making such repairs.

I. Data: Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.

J. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements:
   1. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct deficiencies in the Work promptly to avoid Work delays.
   2. Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.
   3. Contractor responsible for any and all costs incurred resulting from inspection that was scheduled prematurely or retesting due to failed tests.
   4. Remove and replace any Work found defective or not complying with contract document requirements at no additional cost to Owner.
   5. Should test return unacceptable results, Contractor will bear all costs of retesting and re-inspection as well as cost of all material consumed by testing, and replacement of unsatisfactory material and/or workmanship.

K. Protection:
1. Protect construction exposed by or for quality assurance and quality control service activities, and protect repaired construction.

L. Scheduling: Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
1. Schedule testing and inspections in advance so as not to delay the Work and to eliminate any need to uncover Work for testing or inspection.
2. Notify Testing Agency and Architect as noted in Sections in Division 01 through Division 50 prior to any time required for such services.
3. Incorporate adequate time for performance of all inspections and correction of noted deficiencies.
4. Schedule sequence of activities to accommodate required services with minimum of delay.
5. Schedule sequence of activities to avoid necessity of removing and replacing construction to accommodate testing and inspections.

M. Test and Inspection Log:
1. Provide system of tracking all field reports, describing items noted, and resolution of each item. Prepare record of tests and inspections. Include following:
   a. Date test or inspection was conducted.
   b. Description of the Work tested or inspected.
   c. Date test or inspection results were transmitted to Architect.
   d. Identification of Testing Agency or inspector conducting test or inspection.
2. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1.10 TESTING AGENCY SERVICES AND RESPONSIBILITIES

A. Testing Agency, including independent testing laboratories, will be licensed and authorized to operate in jurisdiction in which Project is located.
1. Approved Testing Agency Qualifications. Requirements of Section 01 4301 apply.

B. Testing and Inspection Services:
1. Testing Agency will not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of the Work.
2. Testing Agency will not give direction or instruction to Contractor.
3. Testing Agency will have full authority to see that the Work is performed in strict accordance with requirements of Contract Documents and directions of Owner’s Representative and/or Architect.
4. Testing Agency will not provide additional testing and inspection services beyond scope of Work without prior approval of Owner’s Representative and / or Architect.

C. Testing Agency Duties:
1. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
2. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
3. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
4. Testing Agency must have experience and capability to conduct testing and inspecting indicated by ASTM standards and that specializes in types of tests and inspections to be performed.
5. Testing Agency will comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3666, ASTM D3740, and other relevant ASTM standards.
6. Testing Agency must calibrate all testing equipment at reasonable intervals (minimum yearly) with accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

D. Testing and Inspection Reports:
   1. Conduct and interpret tests and inspections and state in each report whether tested and inspected the Work complies with or deviates from requirements.
   2. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
      a. Description of method of test.
      b. Identification of sample and portion of the Work tested.
         1) Description of location in the Work of sample.
         2) Time and date when sample was obtained.
         3) Weather and climatic conditions at time when sample was obtained.
      c. Evaluation of results of tests including recommendations for action.
   3. Inspection Reports: Testing Agency will furnish 'Inspection at Site' reports for each site visit documenting activities, observations, and inspections. Include notation of weather and climatic conditions, time and date conditions and status of the Work, actions taken, and recommendations or evaluation of the Work.
   4. Reporting Testing and Inspection (Conforming Work):
      a. Submit testing and inspection reports as required within twenty four (24) hours of test or inspection having been performed.
   5. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
      a. Testing Agency, upon determination of irregularities, deficiencies observed or test failure(s) observed in the Work during performance of its services of test or inspection having been performed, will:
         1) Verbally notify results to Architect, Contractor, and Owner's Representative within one hour of test or inspection having been performed (if Defective Work (Non-Conforming Work) is incorporated into project).
         2) Submit written inspection report and test results as required within twenty four (24) hours of test or inspection having been performed.
   6. Final Report:
      a. Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Field Tests and Inspections requirements are described in 'Field Quality Control' in Division 01 through Division 50 Sections.

END OF SECTION

SECTION 01 4546

DUCT TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Is Not Limited To:
   1. Test, balance, and adjust air duct systems services provided by Owner as described in Contract Documents.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contracts Summary': Owner will provide test, balance, and adjust air duct systems. PART 3 of this Section establishes requirements for field tests of 'Testing Agency'.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Division 23:
      a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
      b. Maintain HVAC system and equipment in full operation each working day of testing, balancing, and adjusting.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Contractor to assist Testing Agency in testing and balancing of mechanical system.

B. Scheduling:
   1. Contractor to schedule this work in cooperation with other Sections involved and to comply with completion date for test, balance, and adjust air duct systems as described in Contract Documents.
   2. Contact Testing Agency and coordinate (Owner' Representative to provide 'Testing Agency' contact information):
      a. One inspection when 60 percent of ductwork is installed.
      b. One inspection when 90 percent of equipment and ductwork is installed.
   3. Contact Testing Agency and coordinate date(s) for test and balance work when following is completed:
      a. HVAC and exhaust systems including installation of specialties, devices, and new filters.
      b. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
      c. Automatic temperature controls have been calibrated and set for design operating conditions.
      d. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.
   4. If, in opinion of Testing Agency, systems are not ready for test and balance, reschedule as required.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Test and Evaluation Reports:
      a. Preliminary Report(s):
         1) Four copies to be given to Owner's Representative.

b. Final Report :
1) Four copies to be given to Owner's Representative.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Testing and Inspection Reports:
a) Testing Agency Testing and Evaluation Final Report of testing, balancing, and adjusting air duct systems. Bind approved copy of Testing and Evaluation Report in Operations And Maintenance Manual for Division 23.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Approved Testing Agency. Section 01 4301 applies, but is not limited to following:
a. Testing Agency shall specialize in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing.
c. Testing Agency shall provide testing under direct supervision of qualified heating and ventilating engineer.
d. Neither Architect's engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 OWNER-FURNISHED TESTING AND INSPECTION

A. Owner to provide Testing and Inspection for testing, balancing, and adjusting air duct systems:
1. See Section 01 1200: Multiple contracts for administrative and procedural requirements for Testing and Inspection services.

3.2 FIELD QUALITY CONTROL

A. Field Tests
1. Air System Testing, Adjusting, And Balance:
a. Inspections and site visits. (For paragraph a thru c, note deficiencies, if any, that needs to be corrected and report this to Owner's Representative, Architect, and Mechanical Engineer):
1) One inspection when ductwork installation is 60 percent complete.
2) One inspection when ductwork is installation is 90 percent complete.
3) One inspection when potable hot and cold water system is 90 percent complete.
4) Site visit for test and balance. Before commencing test and balance, perform an inspection to verify 100 percent completion of system. Confirm completion of work, correction of previously noted deficiencies, and look for new deficiencies not noted in previous inspections. If the work is complete, then proceed with test and balance. If the work is not complete and ready for test and balance, inform Contractor and submit an invoice to Owner's Representative for compensation for travel time, expenses, and time on site. Report deficiencies or incomplete work to Owner's Representative, Architect, and Mechanical Engineer.
5) Additional site visits (beyond those set forth above) to complete the work after issues are resolved may be needed and will be paid for separately from compensation for

services set forth in this Agreement, pursuant to hourly rates and conditions set forth in Attachment "A".

b. Checklist for Inspections and site visits:
   1) Pre-Startup Inspection – use for inspections and site visits a thru d in paragraph 1 above. All pertinent items shall be checked, including but not limited to following:
      a) Removal of shipping blocks and stops.
      b) Vibration isolators' alignment and adjustment.
      c) Flexible connections properly installed and aligned.
      d) Safety controls, safety valves and high or low limits in operation.
      e) All systems properly filled.
      f) Filters in place and seal provided around edges.
      g) Filters and strainers are clean.
      h) Fire damper installation and operation, and access door installation.
      i) Installation of all gauges on equipment.
      j) Control system is operating.
      k) All dampers, valves, and operators are properly installed and operating.
      l) All ductwork is installed and sealed.
      m) Voltage to unit matches nameplate voltage.
   2) First Run Inspection – use for inspections and site visits d and e in paragraph 1 above. Recheck items in Pre-Startup list, and check for following items:
      a) Excessive vibration or noise.
      b) Loose components.
      c) Initial control settings.
      d) Motor amperages.
      e) Heat buildup in motors.
      f) Control system is calibrated and functioning as required.
   3) System Operation Inspection – use for inspections and site visits d and e in paragraph 1 above. Observe mechanical systems under operation for sufficient amount of time to ensure proper operation in all running modes. Check following items periodically.
      a) Filters and strainers.
      b) Filters and strainers.
      c) Check for system leaks at seals and valves.

c. Performance Requirements:
   1) Testing and balancing in complete accordance with Associated Air Balance Council (AABC) Standards for Field Measurement & Instructions, Form P1266, Volume I.

d. Site tests: Air Test and Balancing Procedure:
   1) Instruments used by Consultant shall be accurately calibrated and maintained in good working order.
   2) All supply air and return air fans in all HVAC zone systems, energy recovery ventilators, and exhaust fans in building shall be operating when final setup of all units is performed.
   3) Perform tests at high and low speeds of multi-speed systems and single speed systems.
   4) Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards.
      a) Fan Speeds - Air handling units (with variable pitch pulleys and sheaves): Test and adjust fan RPM to achieve design CFM requirements.
      b) Fan Speeds - Furnaces (with direct drive motors): Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary. Adjust low voltage fan speed jumpers (provided and installed by installing contractor) as necessary to achieve design cooling air flow at lowest possible setting. An exception to this would be when furnace is variable speed blower for dehumidification applications.
      c) Current And Voltage: Measure and record motor current and voltage.
      d) Pitot-Tube Traverse Method:
         (1) Make measurements in duct where velocity is uniform, 7-1/2 duct diameters downstream and 2 duct diameters minimum upstream from any turbulence, i.e., elbow, damper, take-off, etc.
         (2) Perform pitot-tube traverse of outdoor ventilation air duct serving each piece of air moving equipment.

(3) Where single outdoor ventilation air trunk duct serves multiple pieces of equipment, perform pitot-tube traverse of duct branch serving each piece of equipment as well as pitot-tube traverse of total air flow in trunk with all pieces of equipment operating.

e) Where pitot-tube traverse is not possible or if pitot-tube traverse is unreliable, flow hood measurement over exterior intake louver or grille is acceptable for measuring outdoor ventilation air.

f) Use proportionate method of air balance leaving fan at lowest possible speed and at least one branch balance damper fully open.

5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.

6) Air Temperature: Take dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.

7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.

8) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

9) Tolerances: Test and balance all fans, zone ducts, registers, diffusers etc. to + or – 10 percent of design CFM.

10) Identification: Identify location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.

11) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.

12) Drafts: Adjust diffusers, grilles, and registers to minimize drafts. For high sidewall supply air diffusers install horizontal blade core to direct air flow upward 15 degree and set adjustable vertical blades to spread air flow horizontally and evenly in fan pattern.

13) Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.

14) Smoke testing: Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 90 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Mechanical Engineer will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.

a) Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Mechanical engineer to generate smoke.

b) Close openings in duct except for one opening at farthest end of duct run.

c) Circulate smoke at pressurized condition of 1/2 inch minimum water gauge static pressure.

d) Report findings to mechanical engineer in writing.

e. Air System Test and Evaluation Report:

1) Record test data on AABC standard forms or facsimile.

2) Preliminary Report: Provide and deliver four copies of complete data for evaluation and approval to Owner.

3) Final report: Provide and deliver complete four copies of final report to Owner prior to project Substantial Completion date.

4) Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.

5) Certified accurate and complete by Consultant’s certified test and balance engineer.

6) Contain following general data in format selected by Consultant:

a) Project Number.

b) Project Title.

c) Project Location.

d) Project Architect and Mechanical Engineer.

e) Consultant and Certified Engineer.

f) Contractor and mechanical sub-contractor.

g) Dates tests were performed.

h) Certification Document.

i) Report Forms similar to AABC Standard format.

7) Report shall include following:
   a) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
   b) HVAC zone identification to include reduced ductwork floor plan from project documents with outlets and inlets numbered to match written test and balance report. This page may be oversized but it should fold up neatly within standard 81/2 x 11 report paper size.
   c) Record following for each piece of air handling equipment:
      (1) Manufacturer, model number, and serial number.
      (2) Design and manufacture rated data.
      (3) Actual CFM.
      (4) Suction and discharge static pressure of each fan.
      (5) Outdoor-ventilation-air and return-air total CFM.
      (6) Final RPM of each motor or speed tap.
      (7) Actual operating current and voltage of each fan motor.
      (8) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
      (9) Belt size and quantity.

3.3 PREPARATION

A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Temporary Utilities.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Where necessary, engage appropriate local utility companies to install temporary service or connect to existing service. Where utility company provides only part of service, provide remainder with matching, compatible materials and equipment. Comply with utility company's recommendations.
   1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
   2. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
   3. Arrange with utility company and existing users for time when service can be interrupted, where necessary, to make connections for temporary services.
   4. Provide adequate capacity at each stage of construction. Before temporary utility availability, provide trucked-in services.
   5. Obtain construction easements necessary to bring temporary and/or permanent utilities to site.
   6. Use qualified personnel for installation and maintenance of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with the Work of Owner or other Contractors on Project Site. Relocate and modify facilities as required.
   7. Pay cost and use charges for temporary facilities and utilities.

B. Prepare schedule indicating dates for implementation and termination of each temporary utility. At earliest feasible time and when acceptable to Owner, change over from use of temporary service to use of permanent service.

C. Keep temporary utilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.

D. Limit availability of temporary utilities to essential and intended uses to reduce waste and abuse.

E. Maintain utilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

F. Remove each temporary utility and control when need has ended, or when replaced by authorized use of permanent utility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary utility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that make up temporary utilities are property of Contractor.
   2. By Substantial Completion, clean and renovate permanent utilities used during construction period, including but not limited to:

a. Replace air filters and clean inside of ductwork and housings.
b. Replace significantly worn parts and parts subjected to unusual operating conditions.
c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

1.3 TEMPORARY ELECTRIC POWER

A. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

1.4 TEMPORARY FIRE PROTECTION

A. Install and maintain temporary fire protection facilities of types needed to protect against predictable and controllable fire losses. At a minimum, provide and maintain in working order two Standard UL Labeled ABC all-purpose 10 lb fire extinguishers. Do not incorporate these extinguishers into final Project.
   1. Locate fire extinguishers where convenient and effective for their intended purpose.
   2. Store combustible materials in containers in fire-safe locations.
   3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
   4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

1.5 TEMPORARY LIGHTING

A. Install and operate temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

1.6 TEMPORARY TELEPHONES

A. Provide temporary telephone service for all personnel engaged in construction activities, throughout construction period.

B. Contractor will pay for Local calls. Party making call will pay for long-distance and toll calls.

C. At each telephone, post list of important telephone numbers.

1.7 TEMPORARY WATER SERVICE

A. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5200

CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Construction Facilities.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Prepare schedule indicating dates for implementation and termination of each temporary facility.

B. Keep temporary facilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.

C. Maintain facilities in good operating condition until removal.

D. Remove each temporary facility when need has ended, or when replaced by authorized use of permanent facility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that make up temporary facilities are property of Contractor.
   2. By Substantial Completion, clean and renovate permanent facilities used during construction period.

1.3 WASTE DISPOSAL FACILITIES

A. Waste Disposal Facilities: Comply with requirements specified in Section 01 7400 "Cleaning and Waste Management."

1.4 SANITARY FACILITIES

A. Provide temporary sanitary toilet. Service and maintain temporary toilet in a clean, sanitary condition.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5400

CONSTRUCTION AIDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Construction Aids.

1.2 SCAFFOLDING, PLATFORMS, STAIRS, ETC

A. Furnish and maintain equipment such as temporary shoring, traffic safety materials as required for safe and proper execution of The Work.

B. Apparatus, equipment, and construction shall meet requirements of applicable laws and safety regulations.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5600

TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Temporary Barriers and Enclosures.

1.2 GENERAL

A. Protection of Existing Improvements: Protect streets, private roads, and sidewalks, including overhead protection where required. Repair damage to existing improvements caused by construction activities.

B. Protection of Adjacent Property: Provide necessary protection for adjacent property and lateral support thereof.

C. Proprietary Camera Services: In its absolute discretion, and with or without notice to Contractor, Owner may provide from time to time, but is not obligated to provide, one or more cameras on or about Project site and/or signage or notices of the same:
   1. If provided by Owner, such camera(s) and/or signage and notices are solely for Owner's benefit and convenience and shall not be for benefit of Contractor, Subcontractor(s) or for any third person.
   2. Owner shall have no liability, obligation, or responsibility to Contractor, Subcontractors, or any third person relative to such camera(s), signage, or notices, or absence of camera(s), signage, or notices, including without limitation, installation, maintenance, operation, repair, testing, functionality, capacity, recording, monitoring, posting, etc., of the same (hereafter 'Proprietary Camera Services').
   3. Contractor, with Owner's prior consent (which shall not be unreasonably withheld), may relocate such camera(s), signage, or notices as necessary to not unreasonably, materially and physically interfere with work at Project Site.
   4. Contractor's obligations under Contract Documents, including but not limited to, Contractor's obligation for security of Project Site, are not modified by Owner's opportunity to provide, actually providing, or not providing Proprietary Camera Services and/or signage or notices regarding the same.
   5. This Specification Section does not preclude Contractor from providing its own camera(s), signage, or notices pursuant to terms and conditions of this Agreement. Neither does this Section reduce, expand or modify any other right or obligation of Owner pursuant to terms of this Agreement.

1.3 TEMPORARY BARRICADES

A. Comply with standards and code requirements in erecting barricades, warning signs, and lights.

B. Take necessary precautions to protect persons, including members of the public, from injury or harm.

1.4 TEMPORARY FENCING

A. Before construction begins, install 6 foot high enclosure fence with lockable entrance gates. Locate where shown on Drawings. If not shown on Drawings, enclose entire site or portion sufficient to accommodate construction operations.

1.5 TEMPORARY SECURITY BARRIERS

A. Install temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and other violations of security.

B. Secure materials and equipment stored on site.

C. Secure building at the end of each work day.

D. Maintain exterior building security until Substantial Completion.

END OF SECTION

SECTION 01 5700

TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Temporary Controls.

1.2 TEMPORARY EROSION AND SEDIMENT CONTROL

A. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.

B. Develop, install, and maintain an erosion control plan as required by law.

C. Repair and correct damage caused by erosion.

1.3 TEMPORARY ENVIRONMENTAL CONTROLS

A. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and reduce possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result:
   1. Avoid use of tools and equipment that produce harmful noise.
   2. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near site.

B. Provide protection against weather (rain, winds, storms, frost, or heat) to maintain all work, materials, apparatus, and fixtures free from injury or damage.

C. Protect excavation, trenches, and building from damage from rain water, spring water, ground water, backing up of drains or sewers, and all other water:
   1. For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with requirements of applicable local regulations. Where feasible, use permanent facilities.
   2. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.

D. Comply with governing ordinances relating to weed control and removal.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5800

PROJECT IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Project Identification.

1.2 TEMPORARY PROJECT SIGNAGE

A. Provide a temporary project Identification sign:
   1. Sign may be free-standing or attached to temporary field office or storage shed.
   2. Sign will be at least 4 feet by 8 feet (1 200 mm by 2 450 mm) and include following information:
      a. Conty of San Bernardino with their logo (s).
      b. Contractor's name and at the option of the contractor their logo.
      c. Architectural firm name and company logo.
   3. Owner reserves the right to remove and/or take possession of any project identification sign.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6100

COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Common Product Requirements.

1.2 GENERAL

A. Provide products that comply with Contract Documents, that are undamaged, and, unless otherwise indicated, new and unused at time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.

B. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on building exterior.
   1. Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
   2. Provide permanent nameplates on items of service-connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate will contain following information and other essential operating data:
      a. Name of product and manufacturer.
      b. Model and serial number.
      c. Capacity.
      d. Speed.
      e. Ratings.

C. Where specifications describe a product or assembly by specifying exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides specified characteristics and otherwise complies with Contract requirements.

D. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application described. General overall performance of product is implied where product is specified for specific application. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.

E. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.

F. Where Specifications require matching an established Sample, Architect's decision will be final on whether proposed product matches satisfactorily. Where no product available within specified category matches satisfactorily nor complies with other specified requirements, refer to Architect.

G. Refer to individual Specification Sections and Allowance provisions in Division 01 for allowances that control product selection, and for procedures required for processing such selections.

H. Remove and replace products and materials not specified in Contract Documents but installed in the Work with specified products and materials at no additional cost to Owner and for no increase in Contract time.

1.3 SUBMITTALS

A. Action Submittals:
1. Product Data: Comparable Product Requests:
a. Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles:
1) Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2) Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 2 working days of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 3 working days of receipt of request, or 2 working days of receipt of additional information or documentation, whichever is later.
a) Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b) Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
3) Submit electronically five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required.
4) Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.

B. Informational Submittals:
1. Sustainable Design Submittals:
a. Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6200

PRODUCT OPTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Product Options.

1.2 GENERAL

A. Product Selection:
   1. When option of selecting between two or more products is given, product selected will be compatible with products previously selected, even if previously selected products were also options.

B. Sustainable Design Requirement:
   1. When option of selection between two or more products is given, consideration should be taken in respect to Sustainable requirements of the project including:
      a. Recycled content.
      b. Regional materials.

C. Non-Conforming Work:
   1. Non-conforming work as covered in Article 12.3 of General Conditions applies, but is not limited, to use of non-specified products or manufacturers.

D. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:
   1. Substitutions And Equal Products:
      a. Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
      b. Approved Products / Manufacturers / Suppliers / Installers:.
         1)
            a) Provide only specified products available from manufacturers listed. No substitutions, private-labeled, or equal products, or mixing of manufacturers' products is allowed on this Project.
            b) In Sections where lists recapitulating Manufacturers previously mentioned in Section are included under heading '*Manufacturers*' or '*Approved Manufacturers*', this is intended as a convenience to Contractor as a listing of contact information only. It is not intended that all manufacturers in list may provide products where specific products and manufacturers are listed elsewhere in Section.
      c. Acceptable Products / Manufacturers / Suppliers / Installers:
         1) Type One: Use specified products / manufacturers unless approval to use other products / manufacturers has been obtained from Architect by Addendum.
         2) Type Two: Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect in writing before installing or applying unlisted or private-labeled products.
         3) Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
      d. Quality / Performance Standard Products / Manufacturers:
         1) Class One: Use specified product / manufacturer or equal product from specified manufacturers only.

2) Class Two: Use specified product / manufacturer or equal product from any manufacturer.
3) Products / manufacturers used shall conform to Contract Document requirements.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6600

PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Product Delivery, Storage, and Handling Requirements.

1.2 GENERAL

A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1.3 DELIVERY AND ACCEPTANCE REQUIREMENTS

A. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.

B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

C. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

1.4 STORAGE AND HANDLING REQUIREMENTS

A. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.

B. Store heavy materials away from Project structure so supporting construction will not be endangered.

C. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7300

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for governing Execution of the Work.

1.2 COMMON INSTALLATION PROVISIONS

A. Manufacturer's Instructions: Comply with Manufacturer's installation instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.

B. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.

C. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.

D. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.

E. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7400

CLEANING AND WASTE MANAGEMENT

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Administrative and procedural requirements for Cleaning and Waste Management as described in Contract Documents.
   2. Administrative and procedural requirements for Cleaning, Salvaging, Recycling and Disposing of Construction Waste as described in Contract Documents.

1.2 REFERENCES

A. Definitions:
   1. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waster or debris.
   2. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
   3. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
   4. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
   5. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

B. Reference Standards:
   1. ASTM International:
      a. ASTM E1609-01, 'Standard Guide for Development and Implementation of a Pollution Prevention Program.'

1.3 PERFORMANCE REQUIREMENTS

A. General:
   1. Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work.
   2. Practice efficient waste management in the use of materials in the course of the Work.
   3. Use all reasonable means to divert construction and demolition waste from landfills and incinerators.

1.4 SUBMITTALS

A. Action Submittals:
   1. Waste Reduction Progress Reports:
      a. Submit plan within 10 days of date established for the Notice to Proceed.

B. Informational Submittals:
   1. Waste Management Progress Reports:
      a. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
         1) Material category.
         2) Generation point of waste.

3) Total quantity of waste in tons (tonnes).
4) Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5) Quantity of waste recycled, both estimated and actual in tons (tonnes).
6) Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

b. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
c. Records of Donations:
1) Indicate receipt and acceptance of salvageable waste donated to individuals and organizations.
2) Indicate whether organization is tax exempt.
d. Records of Sales:
1) Indicate receipt and acceptance of salvageable waste sold to individuals and organizations.
2) Indicate whether organization is tax exempt.
e. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
f. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Comply with hauling and disposal regulations of authorities having jurisdiction (AHJ).

B. Qualifications:
1. Waste Management Coordinator Qualifications:
a. Experienced firm, with a record of successful sustainable waste management coordination of Projects with similar requirements.

1.6 WASTE MANAGEMENT PLAN

A. General:
1. Develop a waste management plan according to ASTM E1609 and requirements of this Section.
2. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis.
3. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification:
1. Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work.
2. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan:
1. List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
a. Disposed Materials:
1) Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
b. Handling and Transportation Procedures:

1) Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

c. Recycled Materials:
1) Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

d. Salvaged Materials for Donation:
1) For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

e. Salvaged Materials for Reuse:
1) For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

f. Salvaged Materials for Sale:
1) For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

2. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
a. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
b. Handling and transportation costs. Include cost of collection containers for each type of waste.
c. Net additional cost or net savings from waste management plan.
d. Revenue from salvaged materials.
e. Revenue from recycled materials.
f. Savings in hauling and tipping fees by donating materials.
g. Savings in hauling and tipping fees that are avoided.
h. Total cost of disposal (with no waste management).
i. Total quantity of waste.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION:

A. General:
1. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract:
a. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Training:
1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site:
a. Distribute waste management plan to everyone concerned within five (5) days of submittal return.
b. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls:
1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
a. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

b. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General:
   1. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
      a. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
      b. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning:
   1. Do not burn waste materials.

C. Disposal:
   1. Transport waste materials off Owner's property and legally dispose of them.

D. Landfill Receipts:
   1. Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

3.3 PROGRESS CLEANING

A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.

B. Keep premises broom clean during progress of the Work.

C. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.

D. During handling and installation, protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from soiling, damage, or deterioration until Substantial Completion.

E. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.

F. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

G. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.

H. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.

I. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.

J. Construction Waste Management And Disposal:

1. Remove waste materials and rubbish caused by employees, Subcontractors, and contractors under separate contract with Owner and dispose of legally. Remove unsuitable or damaged materials and debris from building and from property.
   a. Provide adequate waste receptacles and dispose of materials when full.
   b. Properly store volatile waste and remove daily.
   c. Do not deposit waste into storm drains, sanitary sewers, streams, or waterways. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
2. Do not burn waste materials or build fires on site. Do not bury debris or excess materials on Owner's property.

3.4 FINAL CLEANING

A. Immediately before Substantial Completion, thoroughly clean building and area where The Work was performed. Remove all rubbish from under and about building, landscaped areas and parking lot and leave building and Project Site ready for occupancy by Owner.

B. Comply with individual manufacturer's cleaning instructions.

C. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
   1. Interior Cleaning:
      a. Clean inside glazing, exercising care not to scratch glass.
      b. Remove marks, stains, fingerprints and dirt.
      c. Clean and polish woodwork and finish hardware.
      d. Remove labels that are not permanent labels.
      e. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
      f. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
      g. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
      h. Remove temporary floor protection and clean floors.
   2. Exterior Cleaning:
      a. Clean outside glazing, exercising care not to scratch glass.
      b. Remove marks, stains, and dirt from exterior surfaces.
      c. Clean and polish finish hardware.
      d. Remove temporary protection systems.
      e. Clean dirt, mud, and other foreign material from paving, sidewalks, and gutters.
      f. Clean drop inlets, through-curb drains, and other drainage structures.
      g. Remove trash, debris, and foreign material from landscaped areas.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Closeout Procedures.

1.2 GENERAL

A. Closeout process consists of three specific project closeout inspections. Contractor shall plan sufficient time in construction schedule to allow for required inspections before expiration of Contract Time.

B. Contractor shall conduct his own inspections of The Work and shall not request closeout inspections until The Work of the contract is reasonably complete and correction of obvious defects or omissions are complete or imminent.

C. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect and included on Certificate of Substantial Completion.

1.3 PRELIMINARY CLOSEOUT REVIEW

A. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled.

B. Architect and his appropriate consultants, together with Contractor will review that work.
   1. Punch list of items requiring completion and correction will be created.
   2. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.

C. Architect and his appropriate consultants, together with Contractor and mechanical, plumbing, fire protection, and electrical sub-contractors shall conduct a space by space and exterior inspection to review materials and workmanship and to demonstrate that systems and equipment are operational.
   1. Punch list of items requiring completion and correction will be created.
   2. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.

1.4 SUBSTANTIAL COMPLETION INSPECTION

A. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.

B. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.

C. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
   1. Date of Substantial Completion.

2. Punch List Work not yet completed, including seasonal and long lead items.
3. Amount to be withheld for completion of Punch List Work.
4. Time period for completion of Punch List Work.
5. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.

D. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.

1.5 FINAL ACCEPTANCE MEETING

A. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.

B. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
1. All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.
2. Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
3. Final cleaning requirements have been completed.

C. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.

D. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:
   1. Administrative and procedural requirements for Closeout Submittals.

B. Related Requirements:
   1. Section 01 3300: 'Submittal Procedures' for administrative and procedural requirements for submittal procedures.

1.2 GENERAL

A. Workmanship final certifications, equipment sheets, and similar documents.

B. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

1.3 CLOSEOUT SUBMITTALS

A. Operations And Maintenance Manual:
   1. General:
      a. Include closeout submittal documentation as required by Contract Documentation.
      b. Include workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
      c. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
      d. Include Project photographs, damage or settlement survey, and similar record information required by Contract Documents.
      e. Submittal Format:
         1) Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
         2) Include only closeout submittals as defined in individual specification section as required in Contract Documents.
   2. Project Manual:
      a. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction:
         1) Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications.
         2) Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
   3. Maintenance Contracts:
      a. Digital format only.
   4. Operations and Maintenance Data:
      a. Digital format only:
         1) Cleaning instructions.
         2) Maintenance instructions.
         3) Operations instructions.
         4) Equipment list.
         5) Parts list.
   5. Warranty Documentation:
      a. Digital format of final, executed warranties.

6. Record Documentation:
   a. Digital format only.
      1) Certifications.
      2) Color and pattern selections.
      3) Design Data.
      4) Geotechnical Evaluation Reports (soils reports).
      5) Manufacture Reports.
      6) Manufacturer's literature or cut sheets.
      7) Shop Drawings.
      8) Source Quality Control.
      9) Special Procedures.
      10) Testing and Inspection Agency Reports.
      11) Testing and Inspection Reports.
7. Irrigation Plan.
   a. Laminated and un-laminated reduced sized hard copies.
8. Landscape Management Plan (LMP):
   a. Irrigation Section:
      1) Submittal Format: Digital format and hard copy of each.
      2) Documentation required by sections under 32 8000 Heading: 'Irrigation'.
   b. Landscaping Section:
      1) Submittal Format: Digital format and hard copy of each.
      2) Documentation required by sections under 32 9000 Heading: 'Planting'.

1.4 WARRANTIES

A. When written guarantees beyond one (1) year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manual(s) specified above.

B. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

1.5 PROJECT RECORD DOCUMENTS

A. Do not use record documents for construction purposes. Protect from deterioration and loss in secure, fire-resistive location. Provide access to record documents for Architect's reference during normal working hours.

B. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
   2. Mark new information that is important to Owner, but was not shown on Drawings.
   3. Note related Change Order numbers where applicable.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 02 4113

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Demolish and remove portions of existing site facilities as described in Contract Documents.

B. Related Requirements:
   1. New and replacement work specified in appropriate specification Sections.

1.2 ADMINISTRATIVE REQUIREMENTS

1.3 SUBMITTALS

A. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Identify abandoned utility and service lines and capping locations on record drawings.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 PREPARATION

A. Notify corporations, companies, individuals, and local authorities owning conduits running to property.
   1. Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.
   2. Arrange for removal of wires running to and on property. Remove pipes and sewers in accordance with instructions of above owners.

3.3 PERFORMANCE

A. Execute work in orderly and careful manner, with due consideration for neighbors and the public.

B. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work. Coordinate with Owner for equipment and materials to be removed by Owner.

C. Concrete And Paving Removal:
   1. Saw cut joints between material to be removed and material to remain to full depth.
   2. Hand-excavate trench 12 inches wide and 16 inches deep along concrete or paving to be removed. Cut roots encountered with saw, axe, or pruner. Do not cut roots with excavating

equipment. Remove roots under concrete and paving to be replaced down to 12 inches below finish grade.

3.4 CLEANING

A. Keep streets and roads reasonably clean, and sweep daily.

B. Sprinkle demolition rubbish and debris as necessary to lay dust.

C. Promptly remove demolition materials, rubbish, and debris from property.

END OF SECTION

SECTION 03 10 00 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Design, construction and treatment of formwork and related accessories to confine and shape concrete to the required dimensions.

B. Structural notes indicated on the drawings regarding concrete formwork shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 20 00 - Concrete Reinforcement.

C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where provisions of the pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.
5. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
6. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
7. NIST - PS 1: Structural Plywood

1.4 DESIGN REQUIREMENTS

A. Design and engineering of formwork is the responsibility of the Contractor. Design, engineer and construct formwork, shoring, and bracing to conform to Contract Documents and in accordance with building code requirements. Formwork design shall be under direct supervision of a Structural engineer experienced in the design of this work and licensed in the State where the project is located. Design for construction loads, lateral pressure, and requirements of the applicable building code to conform to the required shape, line, and dimensions. Contractor is responsible for formwork camber calculations.

B. Foundation concrete may be placed directly into neat excavations, provided the foundation trench walls are stable as determined by the Geotechnical Engineer. In such case, the minimum formwork indicated on the drawings is mandatory to ensure clean excavations immediately prior to and during the placing of concrete.

1. When forms are omitted, provide additional 1" concrete minimum on each side of the minimum design profiles and dimensions shown on the drawings.

C. Drawings show the design requirements and dimensions for structural strength, but structural drawings do not show all detail dimensions to fit intricate architectural and mechanical detail. Contractor shall construct the concrete work so that it will conform to the clearance required by the architectural, mechanical, and electrical design.

D. Maximum deflection of facing materials forming concrete surfaces exposed to view shall be 1/240 of the center-to-center span between structural members of the formwork.

E. Carry vertical and lateral loads to the ground by a formwork system and in-place construction that has attained adequate strength for that purpose. Where adequate foundations for shores and struts cannot be secured, provide trussed supports.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions and specifications for each of the following:

1. Waterstop profiles
2. Form sealer
3. Form release agent(s), including certification that agent is compatible with finish
4. Form ties and spreaders

B. Testing for Formwork Removal: When methods other than cylinder tests are proposed for determining time for formwork removal, submit data on methods for approval.

1.6 COORDINATION

A. Coordinate with other sections of work that require attachment of components to formwork.

B. If formwork is placed after reinforcement, resulting in insufficient concrete cover to reinforcement, request instructions from the Owner's Representative or Architect or Structural Engineer before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS AND ACCESSORIES

A. Formwork Accessories: Use commercially manufactured accessories for formwork accessories partially or completely embedded in concrete, including ties and hangers.

B. Sealer: Clear, penetrating, synthetic resin sealer.

C. Formwork Release Agent: Use commercially manufactured form release agents that will prevent formwork absorption of moisture, prevent bond with concrete, and will not stain the concrete surface. Reapply to cleaned forms before each reuse. Formwork release agent shall be compatible with paint or any other finish applied to the concrete; submit data indicating compatibility.

D. Waterstops: Waterstops shall be a flexible butyl rubber and bentonite clay compound that swells upon contact with water.

1. Manufacturers:

a. CETCO - Waterstop RX

E. Form Material:

1. No aluminum shall be allowed in the concrete work unless coated to prevent aluminum-concrete reaction.
2. Concrete form materials must be used in a manner to provide the surface finish specified.
3. Design formwork in accordance with the provisions of the building code or the following standards if not covered in the building code:

a. Wood - AWC "National Design Specification".
b. Plywood - American Plywood Association "Plywood Design Specification".
c. Steel - AISC "Manual of Steel Construction".
d. Aluminum - Aluminum Association "Aluminum Construction Manual"
e. Concrete - ACI 318.
f. Other materials - as directed by manufacturer.

F. Chamfer Strips:

1. Chamfer strips shall be the size as indicated on the drawings. Provide in maximum possible lengths.

G. Keyways:

1. Provide keyways as shown on the drawings. Unless noted otherwise, keyways shall be a minimum of 1-1/2 inches deep and 3-1/2 inches wide. Bevel edges of keyways 10 degrees to facilitate stripping.

2.2 FORM FINISHES

A. Rough Form Finish:

1. Concrete surfaces not exposed to view in the finished work shall have a rough-form finish. No form-facing material is specified for rough-form finish.

2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances. Rough form finish is Designated Surface Finish-1.0 from ACI 301, except that surface tolerance Class C is required as specified in ACI 117.

B. Smooth Form Finish:

1. Concrete surfaces exposed to view in the finished work or surfaces to receive finishes of any type (paint, textured paint, etc.) shall have a smooth form finish. Form-facing material shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. Form-facing material shall produce a smooth, uniform texture on the concrete. Do not use form facing material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that might impair the texture of the concrete surfaces.
2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances. Smooth form finish is Designated Surface Finish-3.0 from ACI 301, including surface tolerance Class A as specified in ACI 117.

C. Patching and repairing concrete finishes are specified under Section 03 30 00.

2.3 FABRICATION AND MANUFACTURE

A. Form Ties and Spreaders: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms, hold inner and outer forms for vertical concrete together, and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1-1/2 inch to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.
4. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.
5. For exposed concrete surfaces, provide form ties of removable type with permanent plugs and a system approved by the Architect for fixing the plugs in place.

B. Waterstops: Fabricate pieces of premolded waterstop with a maximum practicable length to hold the number of end joints to a minimum. Fabricate joints in waterstops in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF TEMPORARY FORMWORK

A. In accordance with ACI 301, construct formwork:

1. Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until the concrete structure can support such loads.
2. Obtain approval before framing openings in structural members not indicated on the drawings.

B. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast concrete surfaces.
2. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
3. Chamfer wood inserts for forming keyways, reglets, recesses, and the like to allow wood to swell without spalling concrete and to ensure easy removal.

C. Falsework:

1. Provide positive means of adjustment (wedges or jacks) of shores and struts. Do not adjust formwork after concrete has taken its initial set. Brace formwork securely against lateral deflection and lateral instability.
2. To maintain specified tolerances, camber formwork to compensate for anticipated deflections in formwork prior to hardening of concrete. Formwork camber calculations are the responsibility of the formwork designer. Set formwork and intermediate screed strips for slabs accurately to produce designated elevations and contours of the finished surface prior to removal of formwork. Ensure edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds when the finish specified requires the use of such equipment.
3. When formwork is cambered, set screeds to a like camber to maintain required concrete thickness.
4. Verify lines, levels, and centers before proceeding with formwork. Ensure dimensions agree with the drawings.
5. Fasten form wedges in place after final adjustment of forms and prior to concrete placement.
6. Anchor formwork to shores, supporting surfaces, or members to prevent upward or lateral movement of the formwork system during concrete placement.
7. Securely brace and shore forms to prevent displacement and to safely support construction loads.
8. Construct forms plumb and straight to conform to slopes, lines, and dimensions shown.
9. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
10. Provide runways for moving equipment and support runways directly on formwork or structural member without resting on the reinforcing steel.

D. Where end-of-work sequence requires a joint in the concrete, provide adequately designed additional formwork. Extend reinforcement through formwork and key joints as indicated on the drawings. Location of the construction joint is subject to approval by the Architect and the Structural Engineer.

E. Construct formwork for wall openings to facilitate removal and to counteract swelling of wood formwork. Keep wood forms wet as necessary to prevent shrinkage.

F. Do not use rust-stained steel form-facing material.

G. Provide temporary openings at the base of column and wall formwork and at other points where necessary to facilitate cleaning and inspection.

H. Unless noted otherwise, all footings shall be centered under walls, piers, or columns.

I. Provisions for Other Trades:

1. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for support of adjoining work prior to concrete placement.
2. Position and support expansion joint material and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.

J. Projecting corners of beams, walls and columns shall be formed with a 3/4-inch chamfer, unless noted otherwise on architectural drawings.

K. Cleaning:

1. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before concrete is placed.
2. Cover surfaces of formwork with acceptable formwork release agent. Apply form release agent before placing reinforcing steel and concrete according to manufacturer's written instructions. Do not allow formwork release agent to puddle in forms. Do not allow formwork release agent to contact reinforcing steel or hardened concrete against which fresh concrete is to be placed. Do not apply form release agent to concrete surfaces receiving special finishes or applied coverings affected by the agent.
3. Clean and inspect formwork immediately before concrete is placed.

L. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

M. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

3.2 COORDINATION

A. Install all required pipe sleeves, cavities or slots. Notify appropriate trades in due time so they may furnish information and make necessary installations. Check sizes, location and alignment of all openings, frames and other work, which are to be built-in including electrical boxes and conduit.

B. Layout the run of partitions and establish location of openings so other trades may properly locate their work.

C. Core drilling concrete is not permitted unless noted otherwise or approved in writing by the Architect. Notify the Architect in advance of conditions not shown on the drawings.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Built-In Items:

1. Confirm with Architect that all materials to be embedded are suitable for embedment in concrete.
2. Build in anchors, inserts, and other devices indicated or required for various portions of work.
3. Build in sleeves, thimbles, and other items furnished or set in place by other trades.
4. Accurately position and support all embedded items prior to concrete placement. Secure embedded items against displacement during concrete placement operations.
5. Fill voids with readily removable material to prevent entry of concrete into voids.
6. Mechanical and Electrical shall provide and set required sleeves.
7. Coordinate setting of all embedded items.

B. Waterstops:

1. Locate waterstops in joints where indicated on the drawings.
2. Build in waterstops using longest unbroken lengths possible to hold the number of end splices to a minimum.
3. Form splices and intersections strictly according to the manufacturer's instructions so waterstops are continuous and develop an effective watertight joint.
4. In general, waterstops should be located just behind outermost layer of reinforcing. Do not place waterstops closer than 2" from face of concrete.

3.4 TOLERANCES

A. Construction formwork to maintain tolerances required by ACI 301 and ACI 117.

3.5 REMOVAL OF FORMS

A. When removal of formwork is based on concrete reaching a specified compressive strength, concrete will be presumed to have reached this strength when either of the following requirements has been met:

1. Test cylinders, molded and cured under the same conditions for moisture and temperature as used for the concrete they represent, have reached the specified compressive strength.
2. Concrete has been cured in accordance with the specifications for the same length of time as laboratory-cured cylinders, which have reached the specified strength. Determine the length of time concrete has been cured in the structure by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50°F and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

B. Forms shall remain in place for the following periods of time. These periods represent cumulative number days or hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50°F:

1. Footings: 67% specified compressive strength or minimum 24 hours.

C. When finishing is required, remove forms as soon as removal operations will not damage concrete.

3.6 FASTENER REMOVAL

A. Remove all protruding fasteners left as a result of securing inserts to forms by Contractor responsible for insert.

B. Cutting flush with surface is not acceptable.

C. Patch exposed concrete surfaces if damaged during fastener removal process.

3.7 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Architect.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and placement of reinforcing steel for concrete and all related accessories.

B. Reinforcing steel for use in bond beams, masonry columns, and lintels is specified in Division 4 and is not a part of the work in this section.

C. Structural notes indicated on the drawings regarding concrete reinforcement shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 10 00 - Concrete Formwork.

C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI SP-066 - ACI Detailing Manual.
5. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
8. AWD D1.8 - Structural Welding Code - Seismic Supplement.
9. California Building Standards Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2 (including all supplements).
10. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

1.4 SUBMITTALS

A. Placing Drawings: Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement accessories. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel, bending and cutting diagrams, anchors, and supporting and spacing devices. Dowels shall be shown in placing drawings for the element that is to be placed first. Reinforcing steel descriptions or shop drawings shall be inch-pound sizes.

B. Product Data: Submit product data sheets for all specified products.

C. Manufacturer's Certifications:

1. Submit mill certifications at time of delivery.
2. Submit carbon equivalent (CE) for reinforcing bars to be welded.

D. Splices: Submit request for splices not indicated in the Contract Documents. Request shall indicate locations, types, and lengths of splices for approval.

E. Field Bending: Submit requests and procedure for field bending or straightening of reinforcement partially embedded in concrete not described in the Contract Documents.

F. Reinforcement Relocation: Submit requests to adjust reinforcement spacing necessitated by conflicts with other reinforcement, conduits, etc. for approval.

G. Mechanical Connections: Submit request for the use of mechanical connections not shown on the project drawings. Include engineering data on proprietary connection devices for approval.

H. Welding Procedure Specifications: For welding of reinforcing steel, include designations of processes (e.g. SMAW, GAMW, FCAW, etc.), weld symbols, and details. All WPS shall be qualified by current Procedure Qualification Record (PQR) per AWS D1.4 and approved by the Structural Engineer.

I. Alternative Reinforcement: Submit request to relocate any reinforcing bars that exceeds placement tolerances.

1.5 COORDINATION

A. Coordinate reinforcement installation with the placement of formwork and other embedded items such as inserts, conduit, pipe sleeves, drains, metal supports, anchor rods, etc.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to the jobsite in bundles sorted and labeled with durable tags indicating bar size, length, and shop drawing mark. Bundles shall also bear testing laboratory tags indicating identified steel.

B. Store elevated clear of ground and protect at all times from contamination and deterioration.

C. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement.

D. Store welding electrodes in accordance with the requirements of AWS D1.4.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bar Deformations: Bars used for reinforcement shall be deformed except column spirals and welded wire reinforcement, which may be plain.

B. Reinforcing Steel: Reinforcing steel shall conform to the ASTM standard and grade indicated in the General Notes on the drawings.

C. Welded Wire Reinforcement: Welded wire reinforcement shall conform to the ASTM standard indicated in the General Notes on the drawings.

D. Joint Dowel Bars: Plain-steel bars. Cut bars true to length with square ends and free of burrs.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, precast concrete, or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
2. Concrete cast against earth: Bars may be supported by precast concrete bricks or approved prefabricated wire bar supports complying with CRSI recommendations with footpads large enough to support the weight of the bars and construction traffic without being pushed into underlying grade. Precast concrete blocks shall have a minimum compressive strength of 6,000 psi.

2.2 FABRICATION

A. Fabrication Tolerances: Reinforcing steel shall be shop fabricated within tolerances according to ACI 117 and other applicable codes, and shall conform in size, shape, quantity, dimensions, etc. to the construction drawings and approved shop drawings.

B. Bar Condition: Bars shall be free from mill scale, excessive rust, and other coatings, which would reduce or destroy the bond with the concrete. Wipe oil from forms before reinforcement is placed on or adjacent to so that oil will not be tracked over or in any way come into contact with the reinforcement.

C. Bars Bending: Bars shall be bent cold, and no method of fabrication shall be used which would be injurious to the material. Heating of bars for bending is not permitted.

D. Identification: After fabrication, bars shall be sorted, bundled, and tagged with metal tags bearing the bar mark before delivery to the jobsite.

E. Splicing:

1. Continuous reinforcing in beams and grade beams shall be lapped as follows unless noted otherwise:

a. Top bars: Midspan
b. Bottom bars: Directly over support

2. Locate reinforcing splices not indicated on drawings at point of minimum stress. Review location of splices with the Structural Engineer and obtain written approval prior to proceeding.

F. Where beams and grade beams are simple span, top bars shall be continuous for full length and hooked down at each end.

G. Reinforcing for continuous footings shall extend into spread footings a minimum of 2'-0".

H. Dowels between footings and walls or columns shall be the same grade, size and spacing or number as the vertical reinforcing respectively, unless noted otherwise.

I. Welding: Do not weld crossing bars (tack welding) for assembly of reinforcement, supports, or embedded items.

PART 3 - EXECUTION

3.1 PLACING

A. Reinforcement Relocation: When necessary to move reinforcement beyond the specified spacing to avoid interference with other reinforcement, or embedded items, submit resulting arrangement of reinforcement to Structural Engineer for approval.

B. Reinforcement Cutting: Cutting of reinforcement which conflicts with embedded objects is not acceptable.

C. Welded Wire Reinforcement: Extend welded wire reinforcement to within 1 inch of the concrete edge. Lace edges with 16-gauge tie wire. Support welded wire reinforcement during placing of concrete to assure required positioning in the slab. Do not place wire reinforcement on grade or metal deck and raise into position in freshly placed concrete.

D. Wire Tie Orientation: Set wire ties so ends are directed away from the concrete surface.

E. Slab on Grade Reinforcement Placement: Place shrinkage and temperature reinforcement 1/3 of the slab thickness from the top surface of the slabs on grade unless noted otherwise on the drawings.

F. Do not cut, displace, or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

G. Support for Reinforcement: Unless noted otherwise, supports for reinforcement shall have Class 2 protection as defined in the CRSI Manual of Standard Practice. Submit data on supports indicating class of protection at all different locations for approval. Supports shall not be used as bases for runways for concrete-conveying equipment and similar construction loads. Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.

H. Support for Bars in Concrete Cast on Ground: Bar supports for slabs on grade, grade beams, footings, and all other concrete cast directly onto grade shall be supported at an average spacing of 4 feet or less in each direction.

I. Securing Reinforcing Bars: All bars must be placed, spaced, secured, and supported prior to casting concrete. Bars embedded in hardened or partially hardened concrete shall not be bent unless approved in writing prior to placement by the Structural Engineer.

J. Foot Traffic: Restrict foot traffic over the slab on grade reinforcing after it has been properly positioned.

K. Reinforcement at Expansion Joints: Do not continue reinforcement or other embedded metal items bonded to concrete through expansion joints. Dowels bonded on only one side of a joint and waterstops may extend through joint.

L. Pumping Concrete: When using a pump to place concrete, pump hose shall be supported directly on forms. Do not allow hose to rest on reinforcing bars if doing so could cause displacement of bars.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All items required for executing and completing the cast-in-place concrete work and related work shown on the drawings or specified herein. Work shall include installation of items furnished in other sections of these specifications.

B. Concrete paving, and curbs are specified in Division 3 or 32.

C. Structural notes indicated on the drawings regarding cast-in-place concrete shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 10 00 - Concrete Formwork.

C. Section 03 20 00 - Concrete Reinforcement.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
4. ACI 302.2R - Guide for Concrete Slabs that Received Moisture-Sensitive Flooring Materials.
5. ACI 303.1 - Standard Specification for Cast-in-Place Architectural Concrete.
6. ACI 304R - Guide to Measuring, Mixing, Transporting, and Placing Concrete.
7. ACI 305.1 - Specification for Hot Weather Concreting.
8. ACI 306.1 - Guide to Cold Weather Concreting.
9. ACI 308R - Guide to External Curing of Concrete.
10. ACI 309R - Guide for Consolidation of Concrete.
11. ACI 318 - Building Code Requirements for Structural Concrete.
12. ACI 347R - Guide to Formwork for Concrete.
13. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
14. ASTM C33 - Standard Specification for Concrete Aggregates.
15. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

16. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
17. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
18. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
19. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
20. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
21. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
22. ASTM C150 - Standard Specification for Portland Cement.
23. ASTM C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
24. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
25. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
26. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
27. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
28. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
29. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
30. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
31. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
32. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
33. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete.
34. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
35. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
36. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
37. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.
38. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
39. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
40. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
41. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
42. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

1.4 SAMPLING AND TESTING REQUIREMENTS

A. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of the Contract Documents.

B. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

C. Take samples of fresh concrete at the job site for each mix design placed each day. Sampling and testing shall be done after the final addition and proper mixing of any water or admixtures that are added on site.

1. Personnel and testing equipment shall meet the requirements of ASTM E329.
2. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or 5,000 sq. ft. of surface area, whichever is less or fraction thereof of each concrete mixture placed each day.

    a. On a given project, if the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

3. A strength test shall be the average of the strengths of two 6x12 inch or three 4x8 inch cylinders made from the same sample of concrete and tested at 28 days.

D. For each sample of fresh concrete, perform the following duties:

1. Measure and record slump in accordance with ASTM C143.
2. Measure and record temperature in accordance with ASTM C1064.

    a. Provide one test hourly when air temperature is 40°F and below and when 80°F and above, and one test for each composite sample.

3. Measure and record air content by volume in accordance with either ASTM C231 or ASTM C173.
4. Measure and record shrinkage percentage in accordance with ASTM C157, with the following modifications:

    a. Slump of concrete for testing shall match job requirements and need not be limited to the restrictions as stated in ASTM C157.
    b. Report results in accordance with ASTM C157 at 0, 7, 14 and 28 days of drying.

5. Mold three 6x12 inch or four 4x8 inch cylinders (laboratory cylinders) in accordance with ASTM C31 to be laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and testing.

6. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured. Field cylinder shall be placed as near as possible to the in-place concrete from which it was taken, protected, and cured in the same manner. Deliver field-cured cylinder to testing laboratory, and measure and record compressive strength in accordance with ASTM C39. Field cylinder shall be used to determine if concrete footings, walls, or piers have reached the required compressive strength for steel erection to begin.

E. Measure and record compressive strength in accordance with ASTM C39 for laboratory cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days. Acceptance is based on the average of the two 6x12 inch or three 4x8 inch laboratory cured 28-day tests. Notify Architect in the event strength levels do not meet the acceptance requirements of ACI 318.

1. Any additional cylinders molded for Contractor to have a compressive strength test done before seven days shall be at the Contractor's expense.

F. Prepare and submit test reports to the Architect, Engineer, Contractor and Supplier. Reports shall be completed and furnished within 48 hours of testing. Refer to description in Submittals.

G. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

H. Should the strength of any grade of concrete for any portion of work, as indicated by molded test cylinders, fall below the minimum 28-day compressive strength specified on the drawings, upon approval of the Structural Engineer, the concrete supplier shall adjust the concrete mix for remaining portion of construction so that the resulting concrete meets the minimum strength requirements.

1.5 SUBMITTALS

A. Concrete Materials: Submit information on concrete materials as listed below.

1. Cementitious Materials: Submit type, class, producer name, and certification not more than 90 days old of compliance with applicable ASTM standard.
2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity, water content, and certification not more than 90 days old.
3. Admixtures: Submit product data sheet. Product data shall include: dosages and performance data, brand names, producers, chloride ion concentrations, and certifications of compliance with applicable ASTM standard. Certifications shall not be more than 90 days old.
4. Water: Submit name of source.
5. Environmental Product Declaration (EPD): Submit a product-specific EPD for each mix design including Product Category Rule (PCR), declared product, date of issue, period of validity, and third-party verification.

B. Product Data: Prepare and submit product and performance data for materials and accessories, including patching compounds, joint systems, curing compounds, finish materials, and other concrete related items.

C. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on qualifications for acceptance.

D. Concrete Mix Design:

1. Concrete mix design submittals shall be submitted to the Structural Engineer for review and approval at least 14 days prior to placing concrete.
2. Obtain Structural Engineer approval for each mix design prior to use, including new mix designs required to be prepared should there be a change in materials being used.
3. Submit concrete mixture proportions and characteristics for each concrete mix. Include standard deviation analysis or trial batch data with mix design. Submit historical field test data to demonstrate the average compressive strength for approval. Concrete mix proportions, materials, and handling methods for field test data or trial batches shall be the same as used for the work. Include the following information for each mix design:

    a. Water/cementitious materials ratio.
    b. Slump per ASTM C143
    c. Unit weight of concrete per ASTM C138
    d. Compressive strength at 28 days per ASTM C39

4. If trial batches are used, submit representative samples of each proposed ingredient to independent testing laboratory for use in preparation of mix design.
5. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.
6. Provide a record copy of the final mix designs and test results to the testing agency prior to commencement of the concrete work.

E. Sustainability Measures: Submit manufacturer's certification for each concrete product including the following:

1. Recycled content, including percentage by weight of pre-consumer (post-industrial) and post-consumer recycled content. Also provide manufacturer's name and product cost.
2. Location of manufacturing plant, manufacturer's name, product cost and location of extraction or harvest of raw materials.

F. Slab-on-Grade Joint Layout: Submit drawings for proposed slab-on-grade control joint and construction joint layout for approval.

G. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of test, mix design, and location of concrete in structure.

H. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit the proposed method of removal.

I. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess of concentrations specified herein.

J. Placement Notification: Notify the Architect at least 24 hours in advance of concrete placement.

K. Adjustments: Submit any adjustments to mixture proportions or changes in materials, suppliers, or sources, along with supporting documentation, during the course of the work.

L. Cold Weather Procedure Submittal: Refer to Cold Weather Concreting article in Part 3 for more information.

M. Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Cementitious Materials: Store cementitious materials in dry weather tight buildings, bins, or silos that exclude contaminants.

B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates so as to drain freely.

C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage. Protect liquid admixtures from freezing and temperature changes, which would adversely affect their performance. Handle chemical admixtures in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: Portland cement shall conform to ASTM C150, Type I Normal, and be a standard brand of Portland cement. Use one brand of cement throughout project, unless approved in writing by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type as the cement used in the concrete represented by the submitted field test data or used in the trial mixtures. Maintain consistent cement color throughout project unless directed otherwise by architectural requirements.

1. Total replacement of Portland cement by supplementary cementitious materials in design mixture shall not exceed 50% (by weight).

B. Supplementary Cementitious Materials

1. Fly Ash: Fly ash shall conform to ASTM C618, Class C or Class F. Replacement of Portland cement by fly ash shall not exceed the following (percentages are by weight):

   a. Concrete Flatwork: 20 percent.
   b. Mass Concrete (more than two feet thick): 50 percent.
   c. All other concrete: 25 percent.
   d. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless the cold weather procedure submitted has compensated for the increased setting time and decreased rate of strength gain due to cold weather and fly ash.

2. Slag Cement: ASTM C989, Grade 100 or 120.

   a. Ground Granulated Blast-Furnace Slag Limit: 50% by weight of total cementitious materials.
   b. In mass concrete more than 2 feet thick, the usage rate may be 80% by weight of total cementitious materials.

3. Combined Fly Ash and Ground Granulated Blast-Furnace Slag:

   a. Supplementary Cementitious Materials Limit: 50% with fly ash not exceeding 25% by weight of total cementitious materials.
   b. In mass concrete more than 2 feet thick: 80% with fly ash not exceeding 50% by weight of total cementitious materials.

C. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide coarse aggregate from a single source for exposed concrete. Gradations shall be similar to that described in the following table:

COARSE AGGREGATE GRADATIONS							
SIEVE SIZE - PERCENT PASSING							
Grade No.	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 16
4	90-100 Note 1	20-55	0-15	---	0-5	---	---
57	100	95-100	---	25-60	0-10	0-10	---
67	---	100	90-100	---	20-55	0-10	---
89	---	---	---	100	90-100	20-55	0-10

1. Shall be 100 percent passing the 2" sieve.

D. Do not use aggregates containing deleterious substances that could cause spalling on any exterior exposed surface. These include, but are not limited to the following:

1. Organic impurities.
2. Ferrous metals.
3. Soluble salts.
4. Coal, lignite, or other lightweight materials.
5. Soft particles.
6. Clay lumps and friable particles.
7. Cherts of less than 2.40 specific gravity.

E. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean and free from injurious amounts of acids, alkalis, organic materials, chloride ions and oils deleterious to concrete or reinforcing steel.

F. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for compliance with the Contract Documents.

2.2 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Calcium chloride thiocyanates or admixtures containing intentionally added chlorides are not permitted.

B. Water Reducing Admixture: Material shall comply with ASTM C494, Type A.

1. Acceptable:

a. Master Builders Solutions - MasterPozzolith Series or MasterPolyheed Series.
b. Chemical Company - Eucon WR Series.
c. Sika Chemical Corp. - Plastocrete 161.

C. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494, Type F or Type G.

1. Acceptable:

a. Master Builders Solutions - MasterRheobuild 1000 or MasterGlenium Series.
b. Euclid Chemical Company - Eucon 37 or Plastol Series.
c. Sika - ViscoCrete 2100.

D. High Range Water Reducing, Slump Retaining Admixture: Material shall comply with ASTM C494, Type F or Type G.

1. Acceptable:

a. Master Builders Solutions - MasterGlenium 7700.
b. Euclid Chemical Company - Eucon 537, Eucon 1037, or Plastol Series.
c. Sika - Sikament 686.

E. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain a higher chloride ion concentration than municipal drinking water.

1. Acceptable:

a. Master Builders Solutions - MasterSet FP 20 or MasterSet AC 534.
b. Euclid Chemical Company - Accelguard Series.
c. Sika Chemical Corp. - Sika Rapid-1.
d. .

F. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by the manufacturer to be compatible with other admixtures to be used.

1. Acceptable:

a. Master Builders Solutions - MasterAir Series.
b. Euclid Chemical Company - Air-Mix or AEA Series.
c. Sika Chemical Corporation - Sika-Aer.
d. .

G. Water Reducing and Retarding Admixture: Material shall comply with ASTM C494, Types B and D.

1. Acceptable:

a. Master Builders Solutions - MasterSet R Series or MasterSet DELVO Series.
b. Euclid Chemical Company - Eucon Retarder Series.
c. Sika Chemical Corporation - Plastiment.
d. .

H. Set Accelerating Corrosion-Inhibiting Admixture: Admixture shall contain at least 30% calcium nitrite, while meeting the requirements of ASTM C494 as a Type C admixture.

1. Acceptable:

a. Master Builders Solutions - MasterLife CI 30.
b. Euclid Chemical Company - Eucon CIA.
c. .

I. Shrinkage Reducing and/or Shrinkage Compensating Admixture: Admixture used for the compensation and reduction of shrinkage in Portland cement concrete.

1. Acceptable:

a. Euclid Chemical Company - Conex.
b. Grace Construction Products - Eclipse Floor 200.
c. Master Builders Solutions - MasterLife SRA Series or MasterLife CRA 007 MasterSure Z60 MasterLife 300D.
d. .

J. Workability-Retaining Admixture: Admixture shall retain concrete workability without affecting time of setting or early-age strength development, while meeting the requirements of ASTM C494 as a Type S admixture.

1. Acceptable:

a. Master Builders Solutions – MasterSure Z 60
b.

K. Permeability-Reducing Admixture: Admixture is Portland cement-based crystalline capillary waterproofing material that reacts to form insoluble crystalline hydration products in the capillary pores of concrete. When tested in accordance with CRD-C 48 at a pressure of 200 psi, a reduction is shown when compared to an identical mixture without the admixture. Testing in accordance with DIN 1048 for a duration of 96 hours shows a reduction or no water penetration when compared to an identical mixture without the admixture. NSF-61 certified.

1. Acceptable:

a. Master Builders Solutions – MasterLife 300 Series
b.

L. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented by field test data or used in trial mixes.

2.3 CURING PRODUCTS

A. Moisture Retaining Cover

1. Plastic Film: Use 6 mil polyethylene film sheet materials that meet the requirements of ASTM C171.
2. White burlap-polyethylene sheet meeting ASTM C171.
3. Reinforced curing paper complying with ASTM C171.

B. Curing and Sealing Compound: Clear, membrane-forming curing and sealing compound complying with ASTM C309, Type 1, and ASTM C1315, Type 1, Class A. Compound shall dry to a clear finish, resist yellowing due to ultraviolet degradation and provide a long-lasting finish that has high resistance to chemicals, oil, grease, deicing salts, and abrasion.

1. Curing and sealing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

2.4 MISCELLANEOUS MATERIALS

A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting.

1. Acceptable manufacturers and products:

a. Euclid Chemical Company - Eucospeed.
b. Master Builders Solutions - MasterEmaco N 424.
c. Dayton Superior - Re-Crete 20 minute.
d. .

B. Cement Grout: Mix 1 part Ordinary Portland cementPortland limestone cement, 2-1/2 to 3 parts fine aggregate, and enough water for required consistency. Depending on use, consistency may range from mortar consistency to a mixture that will flow under its own weight. Do not mix more than the amount that can be used within 30 minutes. Retempering is not permitted. Use for leveling, preparing setting pads, beds, construction joints (with liquid bonding admixture) and similar uses. Do not use for grouting under bearing plates or structural members in place.

C. Dry-Pack: Mix 1 part Ordinary Portland cementPortland limestone cement, 2 parts fine aggregate, and enough water to hydrate cement and provide a mixture that can be molded with the hands into a stable ball (a stiff mix). Do not mix more than the amount that can be used within 30 minutes.

D. Expansion Joint Material: Preformed, resilient, non-extruding asphalt-impregnated fiber conforming to ASTM D1751. Thickness of expansion joint material shall be 1/2" unless noted otherwise on the drawings.

E. Magnesium phosphate patching cement specially designed for cold weather grouting and anchoring.

1. Acceptable:

a. Master Builders Solutions - MasterEmaco T545.
b. Euclid Chemical Company - Eucospeed MP.
c. .

F. Vapor Barrier: ASTM E 1745, Class A, not less than 15 mils thick.

1. Acceptable:

a. Stego Industries, LLC - Stego Wrap.
b. .

G. Vapor Retarder: not less than 10 mils thick, of one of the following materials:

1. Polyethylene sheet, ASTM D 4397.
2. Nonwoven, polyester-reinforced, polyethylene coated sheet.
3. .

H. Bonding Agent: "Weld-Crete" manufactured by the Larsen Products Corporation or "Nitobond Acrylic" manufactured by Fosroc Inc. or approved equivalent.

I. Anti-Bonding Agent: "Thompson's Water Seal" as manufactured by A. E. Thompson, Inc., California or approved equivalent.

J. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers and products:

a. Master Builders Solutions - MasterKure HD 200WB.
b. Conspec Marketing & Manufacturing Co., Inc. - Intraseal
c. Curecrete Chemical Co., Inc. - Ashford Formula
d. Dayton Superior Corporation - Day-Chem Sure Hard (J-17)
e. Euclid Chemical Company - Eucosil
f. L&M Construction Chemicals, Inc. - Seal Hard
g. Vexcon Chemicals, Inc - Vexcon Starseal PS
h. SpecChem - SpecHard
i.

K. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

L. Control Joint Filler: Flexible, single-component polyurethane sealant with backer rod compliant with ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written recommendations.

1. Acceptable:

a. Dayton Superior - Perma 230 SL.
b. Euclid Chemical Company - Eucolastic I.
c. Master Builders Solutions - MasterSeal SL 1.
d. .

M. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.5 STRENGTH AND PROPERTIES

A. Concrete Mix Designs: Refer to the drawings for specified compressive strength and other performance criteria. Proportion concrete mixes to meet design and performance requirements. The concrete supplier may produce a mix at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition of site water shall be in accordance with ASTM C94.

B. Accelerators: Add non-chloride accelerator to all concrete slabs placed at air temperatures below 50°F only when approved in the mix design. Use of admixtures will not relax cold weather placement requirements.

C. Water Reducer: Add water reducing admixture or high range water reducing admixtures (superplasticizers) as follows:

1. All pumped concrete.
2. Fiber reinforced concrete.
3. As required for placement or workability.
4. As required by high temperatures, low humidity, or other adverse placement conditions.
5. Concrete with water-cementitious materials ratio below 0.50.

D. No other admixtures shall be used unless approved by Structural Engineer.

E. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more than 0.05% chloride ions by weight shall not be used.

F. Workability: Concrete shall have a workability such that it will fill the forms without voids, honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess water to collect on the surface.

G. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to average air temperature over a 24-hour period as follows:

1. Air temperature below 0°F — Concrete temperature 70°F min.
2. Air temperature 0°F to 30°F — Concrete temperature 65°F min.
3. Air temperature 30°F to 50°F — Concrete temperature 50°F min.
4. Air temperature above 50°F — No minimum temperature
5. The maximum temperature of concrete at the time of delivery shall be 95°F. When concrete temperature exceeds 95°F, concrete supplier shall attempt to reduce temperature by shading aggregates and cement and cooling mix water. When these methods fail to reduce the concrete temperature below 95°F, supplier shall use ice in the water to reduce the concrete temperature. Use set retarding admixtures only when approved in the mix design.

2.6 SUSTAINABILITY MEASURES

A. Concrete flatwork shall contain at least 15% recycled cement (slag cement and fly ash). Concrete footings shall contain at least 50% recycled content. All other concrete shall contain at least 25% recycled cement.

B. Concrete shall be manufactured within 500 miles of the project site. Aggregate, sand, and water shall be procured from within 500 miles of the project site.

C. For concrete global warming potential limits, refer to the structural drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

C. Do not place concrete until data on materials and mix designs have been approved, Architect has been notified, and all other affected trades have coordinated their work.

D. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and embedded items against which concrete will be placed.

E. Prepare previously placed concrete by cleaning with sandblasting, steel brush, or water blast to expose aggregate to minimum 1/4" amplitude.

F. Sandblast all existing concrete surfaces older than 28 days against which concrete is to be placed, unless directed otherwise in writing by Architect/Engineer.

3.2 SLABS

A. Slab on Grade:

1. All interior slabs on grade shall have a polyethylene vapor retarder conforming to ASTM E1745. Lap all joints minimum 6" and seal edges with adhesive tape. Fit vapor retarder around utilities and seal with adhesive tape as required. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
2. Refer to drawings and Section 31 23 00 for required sub-grade preparation beneath slabs on grade.
3. Where vapor retarder is not used below the slab on grade, wet sub-grade below slab prior to placing concrete. Subgrade shall be moist with no free water and no muddy or soft spots.
4. Saw cut control joints: Cut with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Control joints shall be located along column lines, with intermediate joints spaced at a maximum distance indicated on the drawings, unless noted otherwise. Control joints shall be continuous, not staggered or offset. Slab panels shall have a maximum length to width ratio of 1.5 to 1. Provide additional control joints at all reentrant or isolated corners formed in the slab on grade. Refer to the drawings for typical control joint detailing.
5. Provide isolation joints around each column,. Form isolation joints with 1/2" expansion joint material. Extend isolation joint material full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
6. Depress slabs as required for architectural finishes,. Obtain layout and locations from Architect.

7. Verify completion of all under slab work with mechanical and electrical trades before placing slabs.
8. Slope slabs as indicated on the drawings and to provide positive drainage. Slope slab keeping bottom level and varying top. Maintain minimum thickness of concrete as indicated on the drawings. Refer to floor finishes for tolerances.

B. Embedded Items:

1. The outside diameter of embedded conduit or pipe shall not exceed one-third of the slab thickness in structural slabs, including at crossovers, and shall be placed between the top and bottom reinforcing with a minimum 3" clear cover. Conduit or pipe running parallel to each other shall be spaced at least 8" apart and no more than 2 runs stacked vertically in the slab. Conduit or pipe shall not be embedded in any supported slab less than 6" thick. No embedded conduit or pipe is allowed in any concrete slab-on-steel deck.

3.3 CONSTRUCTION JOINTS

A. Slabs: Where slab pour is to receive a subsequent topping or additional concrete, expose aggregate in top surface by brooming in two directions at right angles to each other.

B. Horizontal: Locate horizontal joints at the top of slabs unless otherwise indicated. Reinforcing: Stop all welded wire reinforcement and/or reinforcing at construction joints in slabs on grade and provide dowel bars as detailed. Provide reinforcement at other construction joints as detailed. Roughen and thoroughly clean the surface of the concrete, remove all laitance, and wet the surface before placing new concrete against the joint.

3.4 CONCRETE PLACEMENT

A. Place concrete as continuously as possible until placement is complete. Do not place against concrete that has attained initial set, except at authorized joints. If, for any reason, concrete pour is delayed for more than 45 minutes, bulkhead off pour at last acceptable construction joint. Immediately remove excess concrete and clean forms.

B. Do not begin to place concrete during periods of rain, sleet, or snow unless adequate protection is provided.

C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice, or snow. If earth at bottom of forms has dried out, rewet so the soil is moist, but free of standing water and mud.

D. Notify the Architect in advance if concrete is to be pumped.

E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and approval has been given.

F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop more than 5 feet (10 feet for concrete containing high-range water reducers). Deposit concrete directly into conveyances and directly from conveyances to final points of deposit. Sufficient transportation equipment in good working order shall be on hand before work begins. All conveying equipment must be clean and kept clean during concreting operations. Take every possible precaution to prevent segregation or loss of ingredients.

H. Regulate rate of placement so concrete surface is kept level throughout; a minimum being permitted to flow from one area to another. Use tremie heads spaced at approximately 10-foot intervals for placing concrete in walls. Control rate of placement consistent with form design.

I. Deposit concrete in one continuous operation until section being placed has been completed. For slab thicknesses greater than 12 inches, prevent excessive segregation of aggregate and high temperatures in accordance with ACI 304 and ACI 308. Place concrete in wall forms in layers not greater than 12 inches in depth, each layer being compacted by internal vibration before succeeding layer is placed.

J. Place concrete as near as possible to its final position to prevent segregation or loss of materials. Do not use vibrators to transport concrete within forms. Consolidate concrete in walls, columns, beams, and slabs or joist construction thicker than 8" with internal vibrators (8,000 to 12,000 VPM). Slabs less than 8" thick may be consolidated with internal vibrators (9,000 to 13,500 VPM) or vibrating screeds supported on forms, boards, or rails, approved by the Structural Engineer, supplement vibration by forking or spading by hand along surfaces adjacent to forms and construction joints. Be sure an adequate number of operating vibrator units are on hand to properly consolidate quantity of concrete to be placed, including spares for emergency use.

    1. Vertically insert and remove handheld vibrators at constant intervals 18 to 30 inches apart. Vibrate concrete the maximum amount and time required for complete consolidation, without segregation, and release of entrapped air bubbles, but in no instance exceed 15 seconds per square foot of exposed surface.

K. Re-tempering of concrete shall not be permitted. Concrete that has stood more than 15 minutes after leaving the mixer shall be discarded.

L. Exercise care in placing concrete over waterproof membranes, rigid insulation, and/or protection boards to avoid damaging those materials. Report damage immediately, and do not proceed until damage is repaired.

M. Remove loose debris from hardened surfaces of previous pours, thoroughly wet and slush with a neat cement grout immediately before placing new concrete or apply bonding compound to surface and let dry before placing new concrete.

N. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Remove spilled concrete from existing surfaces immediately. Covering sills, ledges, and other surfaces with protective coverings may be necessary to protect the work.

O. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

P. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor rods for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

Q. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on the drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.5 CONCRETE FINISHES AND TOLERANCES

A. Exposed Smooth Formed Surfaces: Remove forms and perform necessary repairs and patch to produce surface finish-3.0 as specified in ACI 301. Apply the following to smooth-formed finished concrete exposed to view in the finished work. Confirm finishes with the Architect prior to concrete placement by submitting shop drawings indicating locations of all types of finishes.

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.6 CONCRETE SLAB FINISHES AND TOLERANCES

A. Trowel Finish:

1. Screed concrete to an even plane, float, then power trowel the surface.
2. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
3. Provide trowel finish as indicated on the drawings and at the following locations:

a. Concrete floors exposed in finished work unless otherwise indicated.
b. Slabs to receive curing compounds and sealers.
c. Slabs to receive resilient flooring or carpet.

d. .
e. Slabs to receive waterproof membranes.

B. Fine Broom Finish:

1. Screed concrete to an even plane, float, then power trowel the surface. Provide fine hair broom finish perpendicular to slope, free of loose particles, ridges, projections, voids, and concrete droppings.
2. Provide fine broom finish as indicated on the drawings and at the following locations:

a. Stoop slabs.
b. Raised curbs and walkway areas.
c. Slabs to receive thin set ceramic tile.
d. .

C. Broom Finish:

1. Screed concrete to an even plane and then float. Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a coarse broom across the surface.
2. Provide as indicated on the drawings and at the following locations:

a. ADA ramp slabs.
b. Exterior walkway slabs.
c. .

D. Float Finish:

1. Screed concrete to an even plane then float.
2. Provide as indicated on the drawings and at the following locations:

a. Slabs to directly receive concrete topping.
b. Roof slabs to receive loose laid roof insulation.
c. .

E. Floor Finish Tolerances: Floor finish tolerances shall be measured by placing a freestanding (unleveled) 10-foot straightedge anywhere on the slab and allowing it to rest upon two high spots within 72 hours after placement of slab and removal of shoring (if present). The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed:

1. Slab on Grade (Office, School): 1/4"
2. Slab on Grade (General Warehouse): 3/16"
3. Suspended Slabs (Steel frame): 1/4"

F. Slab Drainage: Finish all concrete slabs to proper elevations to ensure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear the cost of corrections to provide positive drainage.

G. Special Tolerances for Concrete Slabs: No abrupt change in vertical elevation of 1/4" or more is acceptable at the interface between slabs and within areas where pedestrian traffic is expected.

3.7 CONCRETE CURING

A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

B. Concrete other than high-early strength shall be maintained above 50°F and in a moist condition for at least the first 7 days after placement, except when special curing is used. Special curing procedures shall not be used without written permission from the Structural Engineer.

C. High-early strength concrete shall be maintained above 50°F and in a moist condition until it has reached 2/3 of the specified 28-day compressive strength, but not less than 3 days unless special curing is used with written permission from the Structural Engineer.

D. Formed surfaces shall be cured by leaving the formwork in place during the curing period.

E. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5°F in any one hour or 50°F in any 24-hour period.

F. Protect concrete from injury from the elements until full strength is developed. Protect from mechanical injury.

G. During cold weather construction, all footings shall be protected from frost penetration until the building is enclosed and temporary heat is provided.

3.8 SLAB CURING

A. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface. Use one of the methods described below.

B. Moisture-Retaining-Cover Curing for Concrete Floors Not Exposed in Final Condition: Cover concrete surface with waterproof sheet material as soon as finishing operations are complete and the concrete is sufficiently hard to be undamaged by covering. The cover shall be placed flat on the concrete surface, avoiding wrinkles. Sprinkle concrete with water as necessary during application of covering. Place in widest practicable width, with sides and ends lapped at least 12 inches, and seal with waterproof tape or adhesive. Verify the concrete is continuously wet under the sheets; otherwise, add water through soaker hoses under the sheets. Weight down covering to prevent displacement. Immediately repair any holes or tears during the curing period using polyethylene sheet and waterproof tape. Curing process shall be maintained for a minimum of 7 days.

C. Moisture-Retaining-Fabric Curing for Concrete Floors to Remain Exposed: Cover concrete surface with moisture retaining fabric as soon as finishing operations are complete and the concrete is sufficiently hard to be undamaged by covering. The cover shall be installed in accordance with the manufacturer's written recommendations, in largest practical widths. Wet the slab to rejection, then thoroughly wet fabric side of cover and install with poly side up. Lap over adjacent covers a minimum of 18". Wet all laps and outside edges to prevent displacement and to ensure intimate contact with concrete and adjacent covers. Rewet as necessary and protect covers from damage during curing process.

1. After minimum 7-day cure, remove moisture retaining fabric in sections.
2. A maximum of 3,500 square feet of concrete curing cover may be removed at any one time. At no time shall the exposed area be permitted to dry prior to completion of the floor scrubbing process.
3. Using a high-powered floor scrubber capable of a minimum 80 pounds head pressure, and a mild citrus-based detergent that does not damage or mar the surface in any way, scrub the floor to remove any minerals or soluble salts that may have accumulated at the floor surface. Rinse area thoroughly with clean fresh water. Remove water and allow floor to dry. If whitening occurs during drying, repeat scrubbing process before floor dries until no whitening occurs during drying.
4. All areas of the floor shall remain wet during floor scrubbing process. Expose only the amount of floor surface that can be cleaned before any drying occurs without exceeding the maximum allowable exposed area.

D. Curing Compound: Apply uniformly in continuous operation by low pressure spray equipment or roller as soon as finishing operations are complete, free water on the surface has disappeared, and no water sheen can be seen. Follow the manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. Verify compatibility of the curing compound with paint, finishes, or toppings that require positive bond to the concrete. If curing compound is not compatible with paint finishes or toppings, utilize a dissipating curing compound and remove in accordance with the manufacturer's recommendations.

3.9 APPLICATION OF FLOOR SEALER - FINISH COAT

A. Give concrete floors, as indicated in the Room Finish Schedule and where exposed in finished Work, a second coat of curing and sealing compound immediately prior to Substantial Completion.

B. Clean floors and apply sealer strictly according to manufacturer's instructions. Dilution and coverage shall be as recommended by the manufacturer. Apply sealer evenly.

3.10 COLD WEATHER CONCRETING

A. Definition: Cold weather shall be defined as a period when for more than three successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24-hour duration, the period shall not be regarded as cold weather.

B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of ACI 306.1, "Standard Specification for Cold Weather Concreting", published by the American Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this specification.

C. Planning: The General Contractor, concrete contractor, shall have a pre-construction conference to outline the cold weather concreting operations concerning the placing, finishing, curing and protection of the concrete during cold weather. Pre-construction conference shall occur before cold weather is expected to occur.

D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed procedures for the production, transportation placement, protection, curing and temperature monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt changes in weather conditions. Do not begin cold weather concreting until these procedures have been reviewed and approved.

E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated should be properly air entrained as outlined in this specification.

F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum period of 72 hours, unless approved by the Structural Engineer. The protection period may be reduced according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce the protection period, by outlining the method used to achieve the reduction per ACI 306.1.

1. When practical for the construction schedule, formwork shall be insulated and remain in place for at least the required protection period.

G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall be as specified in the following table.

			Mixing Temperatures		
Section Size	Minimum temperature of concrete as placed and maintained during the protection period	Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection.	Above 30°F	0 to 30°F	Below 0°F

Less than 12 in	55°F	50°F	60°F	65°F	70°F
12-36 in	50°F	40°F	55°F	60°F	65°F
36-72 in	50°F	30°F	50°F	55°F	60°F
Greater than 72 in	50°F	20°F	45°F	50°F	55°F

H. Mixing Temperatures: As the ambient air temperature decreases, the concrete mixing temperature shall be increased to compensate for the heat lost in the period between mixing and placement. The concrete supplier shall use one or both of the following methods for increasing the concrete temperature.

1. Heating the mixing water to a temperature necessary to offset the temperature losses during transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking special precautions as outlined in ACI 306.
2. Heating the aggregate with a circulated steam piping system.

I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the concrete temperatures during placement and throughout the protection period.

1. Inspection personnel shall keep a record of the date, time, outside air temperature, temperature of concrete as placed, and weather conditions.
2. Temperature of the concrete and the outside air shall be recorded at regular intervals but not less than twice in a 24-hour period. The record shall include temperatures at several points within the enclosure and on the concrete surface of sufficient frequency to determine a range of temperatures.
3. Inspection agency shall submit the temperature logs to the Architect for permanent job records.

3.11 HOT WEATHER PROTECTION

A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative humidity, high winds, and intense solar radiation that leads to higher than usual evaporation. The table below defines low relative humidity based on air temperature. For a given air temperature, if the relative humidity is equal to or less than the specified minimum, provisions for hot weather concreting shall be as follows:

Air Temperature	Minimum Relative Humidity
105°F	90%
100°F	80%
95°F	70%
90°F	60%
85°F	50%
80°F	40%
75°F	30%

B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed until the building is enclosed to protect the concrete from wind and direct sunlight. The construction schedule shall account for 7-day moist curing period.

C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete shall be mixed at a water-cement ratio, which is lower than the specified maximum, to allow for the adjustment of slump by addition of water in the field. Water reduction shall be accomplished without reducing initial slump by increasing dosage of a water reducing admixture.

D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades and reinforcing bars with water spray from fog nozzle prior to concrete placement.

E. Delivery: Site traffic shall be coordinated, and delivery times scheduled to minimize waiting times for concrete trucks.

F. Placement: Preparations shall be made to place and consolidate the concrete at the fastest possible rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand on concrete surface.

G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where fogging is not possible, apply sprayable moisture-retaining film between finishing passes.

H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture. Flat work shall be moisture cured as described in this specification. Moist curing shall continue for at least 7 days.

3.12 FIELD QUALITY ASSURANCE

A. Independent Testing Agency and Special Inspector shall each perform their prescribed inspection, sampling, and testing services as described in Part 1 of this specification section.

B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory test cylinders for a particular portion of the structure fails to meet requirements of ACI 301, for evaluation of concrete strength, Structural Engineer shall have the right to order compressive or flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength of the in situ concrete, and such tests shall be paid for by the Contractor. Where cores have been cut from the Work, Contractor shall fill voids with dry-pack and patch the finish to match the adjacent existing surfaces.

3.13 REPAIR OF DEFECTIVE AREAS

A. All repair of defective areas shall be made, with prior approval of Architect and Structural Engineer as to method and procedure, in accordance with Section 5 of ACI 301, except specified bonding compound must be used. Cosmetic repairs of minor defects in exposed concrete surfaces shall be in a manner acceptable to the Architect. Defective areas shall be deemed when:

1. Tests on core or prism specimens fail to show specified strengths.
2. Not formed as indicated or detailed.
3. Not plumb or level where so indicated or required to receive subsequent work.
4. Not true to intended grades and levels.
5. Cut, filled, or resurfaced, unless under direction of the Structural Engineer.
6. Debris is embedded therein.
7. Not fully in conformance with provisions of the drawings.
8. Damaged by hot or cold weather conditions.
9. Mixing time exceeds 90 minutes from ready-mix plant to the time of deposit.

B. Patch form tie holes at the following locations:

1. Unfinished exposed concrete (not scheduled for painting, plus at board formed concrete finish).
2. All other areas: Prime voids with bonding compound and fill with patching mortar. Strike flush without overlap, float to uniform texture to match adjacent surfaces.
3. Exposed areas scheduled for spray texture:

   a. Remove projections and protrusions: 1/16" or larger.
   b. Remove continuous ridges 1/32" or larger.
   c. Fill voids and pin holes.

4. Exposed areas scheduled for paint or epoxy:

   a. Remove projections, ridges, and other protrusions 1/32" or larger.
   b. Fill voids and pin holes 1/16" or larger.

5. Exposed areas not scheduled for paint or other finishes:

   a. Remove projections, ridges and other protrusions not conforming to requirements specified under Section 03 10 00.
   b. Fill voids and pin holes not conforming to requirements specified under Section 03 10 00.

C. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Ordinary Portland cementPortland limestone cement and standard Ordinary Portland cementPortland limestone cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.14 CEMENT GROUT AND DRY-PACK

A. Cement Grout: Thoroughly mix sufficient quantities to avoid combining different batches of grout mix. Ensure that grout completely fills all spaces and voids. Level, screed, or cut flush excess grout to produce smooth, neat, even exposed surfaces.

B. Dry-Pack: Thoroughly blend dry ingredients prior to mixing with water. Forcibly pack mixture to completely fill voids and spaces.

3.15 CLEANING

A. Clean exposed concrete to remove laitance, efflorescence and stains.

END OF SECTION

STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Design, construction, and safety of formwork.
   2. Furnish and install required formwork ready for placing of concrete.
   3. Strip and dispose of formwork.

B. Related Requirements:
   1. Section 03 1513: 'Waterstops'.
   2. Section 03 3000: 'Cast-In-Place Structural Concrete' for:
      a. Tolerances for placing structural concrete.
      b. Pre-installation conference held jointly with other concrete related sections.
   3. Section 32 3213: Cast-In-Place Concrete Retaining Walls'.

1.2 REFERENCES

A. Reference Standards:
   1. American Concrete Institute:
      a. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conference as specified in Section 03 3111.
   2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
      a. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
         1) Review requirements and frequency of testing and inspections.

B. Scheduling:
   1. Notify Testing Agency and Architect as directed in Section 03 3111.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Manufacturer Instructions:
      a. Printed application instructions for form release agents.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Forms: Wood, metal, or plastic as arranged by Contractor:
   1. Forming material shall be compatible with specified form release agents and with finish requirements for concrete to be left exposed or to receive a smooth rubbed finish.

2.2 ACCESSORIES

A. Form Release Agents:
   1. Unexposed Surfaces Only: Contractor's option.

B. Expansion / Contraction Joints:
   1. 1/2 inch thick.
   2. Manufactured commercial fiber type:
      a. Meet requirements of ASTM D1751.
      b. Type Two Acceptable Products:
         1) Conflex by Knight-Celotex, Northfield, IL www.aknightcompany.com.
         2) Sealtight by W R Meadows Inc, Hampshire, IL www.wrmeadows.com.
         3) Equal as approved by Architect before installation. See Section 01 6200.
   3. Recycled Vinyl:
      a. Light gray color.
      b. Type Two Acceptable Products:
         1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
         2) Equal as approved by Architect before Installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Forms:
   1. Assemble forms so forms are sufficiently tight to prevent leakage.
   2. Properly brace and tie forms.
   3. Provide temporary cleanouts at base of tall forms if used to facilitate cleaning and inspection.
   4. Make proper form adjustments before, during, and after concreting.
   5. Use new forms, or used forms that have been cleaned of loose concrete and other debris from previous concreting and repaired to proper condition. Use APA Plyform B-B Class I, or APA HDO Plyform B-B Class I, on exposed to view concrete that do not receive a smooth rubbed finish.
   6. Use metal cold joint forms when unable to place concrete for footings, foundations, and slabs in continuous pours.

B. Accessories:
   1. General:
      a. Provide for installation of inserts, templates, fastening devices, sleeves, and other accessories to be set in concrete before placing.
      b. Position anchor bolts for hold-down anchors and columns and securely tie in place before placing concrete.
   2. Form Release / Finish Agents:
      a. Film thickness shall be no thicker than as recommended by Manufacturer.
      b. Allow no release / finish agent on reinforcing steel or footings.
   3. Expansion Joints:
      a. Install at joints between floor slab and foundation wall where shown on Drawings.

C. Form Removal (Slab on Grade):
   1. Removal of forms can usually be accomplished in twelve (12) to twenty-four (24) hours.
   2. If temperature is below 50 deg F or if concrete (stairs, beams, etc) depends on forms for structural support, leave forms intact for sufficient period for concrete to reach adequate strength.
   3. For exposed to view surfaces that receive a smooth rubbed finish, remove forms while concrete is still “green”.
   4. Metal bars or prys should not be used. Use wood wedges, tapping gradually when necessary.

3.2 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Concrete Formwork:
      a. Inspections are not required and will be performed at discretion of Architect.

END OF SECTION

SECTION 03 1511

CONCRETE ANCHORS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Cast-in place and post-installed concrete anchors including:
      a. Adhesive anchors for concrete.
      b. Expansion anchors for concrete.
      c. Screw anchors for concrete.
      d. Concrete anchors and inserts not specified elsewhere.
   2. Installer responsible when inspection results of concrete anchors require corrective actions.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 03 3000: 'Cast-In-Place Structural Concrete' for installation and inspection of cast-in-place anchors.

1.2 REFERENCES

A. Reference Standards:
   1. American Concrete Institute:
      a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
      b. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
   2. American National Standards Institute / American Welding Society (Following are specifically referenced for Structural Steel testing):
      a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
   3. ASTM International:
      a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength'.
      b. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
      c. ASTM A706/A706M-16, 'Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement'.
      d. ASTM F1554-18, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
      e. ASTM F3125/F3125-15a, 'Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
   4. International Code Council (IBC) (2018 or most recent edition adopted by AHJ):
      a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Inspection shall be performed according CBC requirements.

2. Notify Testing Agency and Architect one week before installing anchors so inspection may be scheduled.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's product literature for each item.

B. Informational Submittals:
   1. Certificates:
      a. Adhesive Anchors:
         1) Installer to provide current ACI/CRSI certification to Architect prior to installation of anchors.
   2. Test And Evaluation Reports:
      a. Provide ESR for products used indicating conformance with current applicable ESR Acceptance Criteria.
   3. Manufacturer’s Instructions:
      a. Manufacturer's published installation recommendations for each item.
   4. Qualification Statements:
      a. All concrete anchors except Adhesive Anchors:
         1) Installer to provide record of installer installation training showing dates and those trained for all installed products when required when by Architect.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency inspection reports of all inspected anchors.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Having sufficient capacity to produce and deliver required materials without causing delay in work.
   2. Installer:
      a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.
      b. Adhesive Anchors:
         1) Adhesive Anchors installed in horizontal to vertical overhead orientation to support sustained tension loads shall be installed by Certified Adhesive Anchor Installer (AAI) as certified through ACI/CRSI:
            a) Refer to most current version of ACI 318 for certification requirements.
            b) Proof of current certification shall be submitted to the Architect for approval prior to commencement of installation.
      c. All other Concrete Anchors:
         1) Arrange for manufacturer’s field representative to provide installation training for all products to be used, prior to commencement of work:
            a) Provide installation training when required by Architect.

B. Field Inspection:
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Inspection for post-installed concrete anchors:

a. Owner will employ testing agency to perform inspection for post-installed concrete anchors as specified in Field Quality Control in Part 3 of this specification:
   1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
   2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Store materials protected from exposure to harmful weather conditions and as directed by Manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Anchors:
   1. General:
      a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Contract Drawings.
      b. Install hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with 1/4 inch by 3 inch x 3 inch minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
      c. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
      d. Conform to requirements of ASTM F3125/F3125 for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
   2. Threaded rod for adhesive anchors and cast-in anchors:
      a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
   3. Cast-In-Place Anchor Bolts:
      a. J-Bolts:
         1) Non-headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
         2) Anchor hook to project 2 inches minimum including bolt diameter.
      b. Headed Bolts:
         1) Headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
   4. Reinforcing Bars:
      a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60.
   5. Adhesive Anchors:
      a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC308 for concrete.
      b. Rod diameter and embedment length as indicated on Contract Drawings.
      c. Type Two Acceptable Products:
         1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
         2) Pure 110+ by Powers Fasteners Inc., Brewster NY www.powers.com.
         3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
         4) Equal as approved by Architect before installation. See Section 01 6200.

6. Expansion Anchors:
   a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC193 for concrete.
   b. Type Two Acceptable Products:
      1) KWIK Bolt TZ-2 Expansion Anchor by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
      2) Power-Stud +SD2 by Powers Fasteners Inc., Brewster NY www.powers.com.
      3) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
      4) Equal as approved by Architect before installation. See Section 01 6200.
7. Screw Anchors:
   a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria AC 193 for concrete.
   b. Type Two Acceptable Products:
      1) KWIK HUS-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
      2) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY www.powers.com.
      3) Titen HD by Simpson Strong Tie Co, Pleasonton, CA www.simpsonanchors.com.
      4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Embedded Items:
      a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors:
         1) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
         2) Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
      b. Notify Engineer if reinforcing steel or other embedded items are encountered during drilling.
   2. Base Material Strength:
      a. Unless otherwise specified, do not drill holes in concrete until:
         1) Concrete has minimum age of 21 days at time of anchor installation.
         2) Concrete has achieved full design strength for load achievement.

3.2 PREPARATION

A. Surface Preparation:
   1. Clean surfaces prior to installation.
   2. Prepare surface in accordance with Manufacturer's written recommendations.

3.3 INSTALLATION

A. Post-Installed Anchors:
   1. General:
      a. Drill holes with rotary impact hammer drills using carbide-tipped bits.
      b. Unless otherwise shown on Drawings, drill holes perpendicular to concrete surface.
      c. Perform anchor installation in accordance with Manufacturer's published instructions.
   2. Adhesive Anchors:
      a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive:

1) Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.

b. Adhesive:
1) Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive.
2) Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
3) Remove excess adhesive from surface and threads of anchor as necessary.

c. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.

d. Temperature:
1) Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors.
2) Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.

3. Expansion Anchors:
a. Protect threads from damage during anchor installation and prior to use.
b. Set anchors to Manufacturer's recommended torque, using a torque wrench. Following attainment of ten (10) percent of specified torque, one hundred (100) percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.

4. Screw Anchors:
a. Protect threads from damage during anchor installation and prior to use.
b. Set anchor flush, collared.
c. Do not exceed Manufacturer's maximum allowed torque when seating anchor.

3.4 FIELD QUALITY CONTROL

A. Field And Inspections:
1. Civil and structural field inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
a. Quality Control is sole responsibility of Contractor.
1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

2. Expansion Anchors / Adhesive Anchors / Screw Anchors:
a. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with Manufacturer's requirements.
b. Inspections:
1) Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
a) The correct rod/anchor is used; size and type.
b) The correct hole size is used and prepared per Manufacturer's instructions.
c) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
d) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
e) Torque applied to anchors does not exceed Manufacturer's allowable limits.
f) Torque applied to anchors is per Manufacturer's instructions.

B. Non-Conforming Work:
1. Contractor is to immediately notify Architect of incorrectly placed, misplaced or malfunctioning anchors and request instructions for corrective actions.

3.5 CLEANING

A. Waste Management:
   1. Disposal of rubbish, debris, and packaging materials.

3.6 PROTECTION

A. General:
   1. Protect installed products from damage during construction.

END OF SECTION

SECTION 03 1513

WATERSTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Waterstops for footings and walls.

B. Related Requirements:
   1. Section 03 3000: 'Cast-In-Place Structural Concrete' for installation of waterstop.

1.2 REFERENCES

A. Reference Standards:
   1. U.S Army Corps of Engineers (USACE):
      a. CRD-C572-74, ‘Specification for Polyvinylchloride Waterstops'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Manufacturer's product literature.
   2. Manufacturer’s installation recommendations.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Waterstops (Contractor Option):
   1. PVC:
      a. Extruded from elastomeric polyvinylchloride to meet requirements of U.S. Army Corps of Engineers CRD-C572.
      b. Category Four Approved Manufacturers. See Section 01 6200 for definition of Categories:
         1) Greenstreak Inc, St Louis, MO www.greenstreak.com.
         2) W R Meadows of Canada, Milton, ON www.wrmeadows.com.
   2. Bentonite:
      a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
         1) Waterstop-RX by CETCO, Arlington Heights, IL www.cetco.com.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 03 3517

CONCRETE SEALER FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install Concrete Sealer on concrete surfaces as described in Contract Documents including:

B. Related Requirements:
   1. Section 03 3000: 'Cast-In-Place Structural Concrete' for concrete mix information and use admixtures.
   2. Section 03 3923: 'Membrane Concrete Curing for curing application.
   3. Section 32 1313: 'Concrete Paving' for requirements for concrete sealers on concrete placed after about September 1.
   4. Section 32 1723: 'Pavement Markings' for concrete pavement parking stripes.

1.2 REFERENCES

A. Definitions:
   1. Concrete Sealers: As used in this specification, are sealers applied to concrete surfaces to protect from surface damage, corrosion, and staining. Sealers either block pores in concrete to reduce absorption of water and salts or form impermeable layer which prevents such materials from passing. Concrete sealer, when selected and applied properly, will prevent intrusion of water and deicers, minimizing freeze/thaw damage.

B. Reference Standards:
   1. American Association of State and Highway Transportation Officials:
      a. AASHTO T 259-02(2012), 'Standard Method of Test for Resistance of Concrete to Chloride Ion'.
      b. AASHTO T 260-97(2011), 'Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials'.
   2. ASTM International:
      a. ASTM C672/C672M-12 'Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals'.
   3. German Institute for Standardization (DIN Standards):
      a. DIN EN 1504-2,' Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete (2005).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Concrete Pavement:
      a. Install Concrete Sealer before paint stripes are placed on concrete pavement.
      b. Apply to prepared surfaces no sooner than about thirty (30) days after concrete placement.
      c. Do not use concrete sealers to replace Membrane Concrete Curing.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
    a. Concrete Sealer:
        1) Manufacturer's product literature or cut-sheets for specified products.
        2) Manufacturer's LEED product literature for specified products.

B. Informational Submittals:
    1. Manufacturer Instructions:
        a. Concrete Sealer: Written preparation and application instructions.
    2. Source Quality Control Submittals:
        a. Provide protection plan of surrounding areas and non-work surfaces if requested by Architect/Owner's Representative.
    3. Qualification Statements:
        a. Applicator: Provide qualification documentation.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
    1. Comply with applicable VOC standards and other local requirements.

B. Qualifications:
    1. Applicator:
        a. Applicator shall be acceptable to Manufacturer as applicator of its product.
        b. Minimum five (5) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding. Include contact information of person with oversight of each project.
        c. Provide qualification documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
    1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
    1. Follow Manufacturer’s written instructions for handling and storage of product:
        a. Store in unopened containers in clean, dry area between 35 deg F (2 deg C) and 110 deg F (43 deg C) or as directed by Manufacturer's instruction.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
    1. Concrete Sealer:
        a. Follow printed Manufacturer's instruction for environmental hazards:
        b. Follow printed Manufacturer's instruction for ambient conditions for application of product including:
            1) Minimum and maximum application temperatures.
            2) Application precautions when rain is expected.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Concrete Sealer:
    1. Description:
        a. Concrete sealer that protects new and existing exterior concrete.

2. Design Criteria:
   a. General:
      1) Penetrating water repellent silane or linseed oil/mineral spirit concrete sealers are to be used.
      2) Siloxanes are not to be used to replace silane or linseed oil/mineral spirits sealers.
   b. Linseed Oil/Mineral Spirits Sealers:
      1) Protects concrete from freeze/thaw cycles and deicing salts.
      2) Resists penetration of water and deicing salts.
   c. Silane Based Sealers:
      1) Protects concrete from freeze/thaw cycles and deicing salts.
      2) Resists penetration of water and deicing salts.
      3) 100 percent silane active ingredient content.
      4) Penetrating sealer.
      5) Water repellant.
      6) Clear (colorless, non-yellowing). Surface appearance after application: unchanged.
3. Limitations:
   a. VOC:
      1) If Low VOC product are required or desired, use only those products listed as 'Low VOC' in acceptable products below.
4. Acceptable Products. See Section 01 6200. Applicator Option:
   a. Linseed Oil/Mineral Spirits Sealers:
      1) Anti Spall J33 Concrete Sealer by Dayton Superior Corporation, Miamisburg, OH www.daytonsuperior.com.
         a) Low VOC.
      2) Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.
   b. Silane Based Sealers:
      1) MasterProtect H 1000 by BASF, Cleveland, OH www.master-builders-solutions.basf.us.
         a) Low VOC.
      2) Weather Worker J29A by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
      3) Baracade Silane 100 by Euclid, Cleveland, OH www.euclidchemical.com.
         a) Low VOC.
      4) Sikagard 705L by Sika Corporation, Lyndhurst, NJ www.usa.sika.com.
         a) Low VOC.
      5) TK-590-100 by TK Products, Minnetonka, MN www.tkproducts.com.
      6) Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Verify concrete has properly cured.

3.2 PREPARATION

A. Surface Preparation:
   1. Concrete Sealer:
      a. Take necessary precautions to protect adjoining property.
      b. Do not contaminate any body of water by direct application, cleaning of equipment or disposal of wastes.
   2. Cleaning:
      a. Clean concrete surface of membrane curing and all dirt, mud spots, silt spots, loose material, vegetation, oil spots, and other objectionable and foreign material.

b. Remove debris, sand, dirt, and dust from concrete surface.
c. Power brooms, power blowers, air compressors, water flushing equipment, and blowers are acceptable equipment for cleaning concrete surface.

3.3 APPLICATION

A. Concrete Sealer:
1. General:
a. Apply concrete sealer after surface preparation has been completed as per Manufacturer's recommendations.
b. Follow Manufacturer's ambient conditions for minimum and maximum application temperatures and application precautions when rain is expected.
c. Stir material thoroughly before and during application if required by Manufacturer.
d. Do not apply sealer if standing water is visible on concrete surface to be treated.
e. Apply even distribution of sealer.
f. Do NOT over apply. All product should penetrate substrate with no surface build-up. Any excess or puddles of material must be removed.
2. Apply Concrete Sealer:
a. Linseed Oil/Mineral Spirits Sealers:
1) For maximum protection, apply onto concrete surface before it is exposed to deicing salts.
2) Do not apply in temperatures below 40 deg F (4.4 deg C).
3) Apply first coat at 1 gallon (3.785 liters) per 350 sq ft (32.5 sq m).
4) When first coat is dry to touch, apply second coat at 1 gallon (3.785 liters) per 600 sq ft (55.7 sq m).
5) When second coat is totally dry, surface is ready for traffic.
6) Texture and absorption of surface will influence final coverage rates.
7) This application will turn concrete to dark amber color.
b. Silane Based Sealers:
1) Apply at rate of about 1 gallon (3.785 liters) per 300 sq ft (27.8 sq meters) or as per Manufacturer's recommendations depending upon absorbency of concrete surface.
3. Allow Concrete Sealer to dry as per Manufacturer's recommendations.

3.4 CLEANING

A. General:
1. Clean tools, equipment and spills as directed by Manufacturer's instructions.
2. Clean drips and over spray while still wet.

B. Waste Management:
1. Sterilant/Concrete Sealers:
a. Follow Manufacturer's recommendations for approved disposal of product and containers.
1) Do not reuse empty containers.

END OF SECTION

SECTION 03 3923

MEMBRANE CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Quality of membrane concrete curing as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3111: 'Cast-In-Place Structural Concrete' for application of membrane concrete curing.
   2. Section 03 3517: 'Concrete Sealer-Finishing' for application of concrete sealer.
   3. Section 32 1313: 'Concrete Paving'.

1.2 REFERENCES

A. Definitions:
   1. Curing: Process by which hydraulic-cement concrete matures and develops hardened properties, over time, as result of continued hydration of cement in presence of sufficient water and heat. Also used to describe action taken to maintain moisture and temperature conditions in freshly placed concrete.

B. Reference Standards:
   1. American Association of State and Highway Transportation Officials:
      a. AASHTO M 148-05, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing'.
   2. ASTM International:
      a. ASTM C309-11, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's product data.
      b. Material Safety Data Sheets (MSDS.

B. Informational Submittals:
   1. Manufacturer Instructions:
      a. Printed installation instructions.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Comply with applicable VOC standards and other local requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
1. Follow Manufacturer's written instructions for handling and storage of product:
a. Store in unopened containers in clean, dry area between 35 deg F (2 deg C) and 110 deg F (43 deg C) (Keep from freezing) or as directed by Manufacturer's instruction.
2. Shelf Life: Do not use curing compound that is over one (1) year from manufacturer date.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Do not apply curing compound when temperature of concrete is less than 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Membrane Concrete Curing:
1. Description:
a. Clear water-based, ready-to use membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
2. Design Criteria:
a. Exterior Concrete:
1) Dissipating or non-dissipating membrane curing agent.
b. Interior Concrete:
1) Dissipating membrane curing agent only.
c. VOC-compliant compound.
d. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
e. Interior concrete: containing no mineral spirits, naptha, or other components detrimental to finish flooring installation.
f. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
g. Gradually dissipate after twenty-eight (28) days without leaving stain or discoloring concrete surface.
3. Horizontal and Vertical Cast-In-Place Structural Concrete:
a. Type One Acceptable Products.
1) Exterior Concrete:
a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
d) VOCOMP 20 (do not use when concrete sealer will be applied in areas of freeze/thaw and deicer salts) by W.R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
e) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
2) Interior Concrete:
a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
d) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
b. Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 03 4800

PRECAST CONCRETE SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install precast concrete elements as described in Contract Documents including but not limited to the following:
      a. Splash blocks.

B. Products Furnished But Not Installed Under This Section:
   1. Detectable warning panels.

C. Related Requirements:
   1. Section 03 3000: 'Cast-In-Place Structural Concrete' for installation of detectable warning panels.
   2. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A615/A615M-18, 'Standard Specification for Deformed and Plain Steel Bars for Concrete Reinforcement'.
      b. ASTM A1064/A1064M-18a, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
      c. ASTM C33/C33M-18, 'Standard Specification for Concrete Aggregates'.
      d. ASTM C150/C150M-18, 'Standard Specification for Portland Cement'.
      e. ASTM C260/C260M-10a(2016), 'Standard Specification for Air-Entraining Admixtures for Concrete'.
   2. ASTM International (following are referenced specifically for detectable warning panels):
      a. ASTM C39/C39M-18, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
      b. ASTM C140-18a, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
      c. ASTM C293/C293M-16, 'Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)'.
      d. ASTM C418-12, 'Standard Test Method for Abrasion Resistance of Concrete by Sandblasting'.
      e. ASTM C947-03(2016), 'Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber-Reinforced Concrete (Using Simple Beam With Third-Point Loading)'.
      f. ASTM C1262/C1262M-18, 'Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer product literature for each type of product indicated.
   2. Shop Drawings:
      a. Precast concrete elements:

1) Detail fabrication and installation of architectural precast concrete units.
2) Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3) Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
   a) Indicate separate face and backup mixture locations and thicknesses.
4) Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
5) Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
6) Include plans and elevations showing unit location and sequence of erection for special conditions.
7) Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
8) Indicate relationship of architectural precast concrete units to adjacent materials.
9) Indicate locations and details of stone facings, anchors, and joint widths.

b. Detectable warning panels:
1) Detail fabrication details and installation of detectable warning panels.
2) Indicate locations on site, plans, dimensions, shapes, and cross sections of each unit.
3) Indicate joints locations and placement.

3. Samples:
a. Detectable warning panels.
1) Provide 4 inch (100 mm) by 4 inch (100 mm) minimum sample of detectable warning panel representing actual finish, color, texture, and patterns.

B. Informational Submittals:
1. Certificates:
a. Precast concrete elements:
1) Material Certificates: For the following items, signed by manufacturers:
   a) Admixtures.
   b) Bearing pads.
   c) Cementitious materials.
   d) Reinforcing materials.

2. Design Submittals:
a. Precast concrete elements:
1) Design Modifications:
   a) If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings.
   b) Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

3. Test And Evaluation Reports:
a. Material Test Reports:
1) Detectable warning panels:
   a) Test reports from qualified independent testing laboratory indicating that material proposed for use meets physical properties indicated herein.

4. Manufacturer's Instructions:
a. Detectable warning panels:
1) Cleaning and maintenance instructions.
2) Preparation and installation instructions.
3) Storage and handling requirements.

5. Source Quality Control Submittals.
a. Precast concrete units:
1) Control test reports.
2) Precast Concrete mix design: Submit compressive strength and water-absorption tests for each precast concrete mix design.

6. Field Quality Control Submittals:
a. Precast concrete units:
1) Provide special inspection reports.

7. Qualification Statements:
a. Precast concrete units:
1) Installer and Fabricator:

a) Letter certifying level of training and experience of Installer and Fabricator.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Operations and Maintenance Data:
1) Detectable Warning Panels: Maintenance instructions.
b. Warranty Documentation:
1) Detectable Warning Panels: Final, executed copy of Warranty.
c. Record Documentation:
1) Manufacturers documentation:
a) Detectable Warning Panels: Manufacturer's literature or cut sheet.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Americans with Disabilities Act – 28 CFR Part 35 Title II and 28 CFR 36 Title II:
a. Comply with requirements of detectable warning surfaces.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Check, carefully unload, and deliver material to site in such manner as to avoid soiling and damaging.
2. Detectable warning panels:
a. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
1. Store material on planks clear of ground and protect from damage.
2. Detectable warning panels:
a. Store pallets on supported flat surface. Do not double stack pallets.

1.6 WARRANTY

A. Manufacturer Warranty:
1. Detectable Warning Panels:
a. Provide Manufacturer Five (5) Year limited Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Materials:
1. Design Criteria:
a. Precast Concrete:
1) Air Entrainment: Wet cast mixture maintains 5 to 7 percent air entrainment where surfaces are exposed to freeze-thaw. Admixture conforms to ASTM C260.
2) Aggregates: ASTM C33/C33M.
3) Cement: ASTM C150/C150M, Type II.
4) Compressive Strength: 4500 psi (31.03 MPa) concrete minimum.
5) Water: Potable water free from impurities.
b. Reinforcing:
1) Bars: ASTM A615/A615M, Grade 60.
2) Reinforcing Mesh: ASTM A1064/A1064M.
c. Concrete Elements:

1) Color:
   a) Add Natural Grey color to mix.
   b) Integral Color: Concentrated dry powder iron oxide pigments designed to meet samples and mock-up.

2.2 ACCESSORIES

A. Sealant: As specified in Section 07 9213: 'Elastomeric Joint Sealants'.

B. Detectable Warnings Panels:
   1. ADA compliant.
   2. Cementitious high strength reinforced concrete panel.
   3. Meet requirements of following:
      a. ASTM C39/C39M or ASTM C140 for compressive strength requirements.
      b. ASTM C140 for water absorption requirements.
      c. ASTM C293 or ASTM C947 for flexural strength requirements.
      d. ASTM C418 or C779 for abrasion resistance requirements.
      e. ASTM C1262/C1262M for freeze thaw requirements.
   4. Dome spacing: standard spacing approved by code.
   5. Colors: Select color from Manufacturer's available colors and local ADJ requirements.
   6. Approved Products. See Section 01 6200.
      a. TekWay Dome Tiles by StrongGo Industries, Tucson, AZ. www.stronggo.com.
      b. CASTinTACT by Masons Supply Co., Portland OR. www.masco.net/castintactweb.

2.3 FABRICATION

A. General:
   1. Chamfered edges.
   2. Smooth finish free from pits and rock pockets.

B. Splash Blocks:
   1. 16 inches (400 mm) wide by 24 inches (600 mm) long by 3 inches (75 mm) high.
   2. Formed water trough.
   3. Cast in reinforcing mesh.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Splash Blocks: Set level in planting areas and centered under each downspout.

B. Detectable warning panels:
   1. Follow Manufacturers installation instructions.

END OF SECTION

SECTION 03 6213

NON-METALLIC NON-SHRINK GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install structural grout as described in Contract Documents.
      a. For grout base for structural columns.
      b. For grout base for exterior light poles.
      c. For grout base for machine bases.
      d. For securing anchor bolts and hardware in concrete.
      e. For securing anchor bolts and hardware in masonry.

B. Related Requirements:
   1. Section 04 0516: 'Masonry Grouting'.

1.2 REFERENCES

A. Association Publications:
   1. American Concrete Institute:
      a. ACI 305R-10, ‘Guide to Hot Weather Concreting’.
      b. ACI 306R-10, 'Guide to Cold Weather Concreting’.
      c. ACI 351.1R-12, ‘Grouting Between Foundations and Bases for Support of Equipment and Machinery’.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C1107/C1107M-17, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).'
   2. United States Army Corps of Engineers (USACE):
      a. CRD C-621-93, ‘Handbook for Concrete and Cement Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink’.

1.3 SUBMITTALS

A. Action Submittals
   1. Product Data:
      a. Manufacturer's data sheets on each product to be used, including:
         1) Preparation instructions and recommendations.
         2) Storage and handling requirements and recommendations.
         3) Manufacturer's printed installation instructions for each product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact clearly identifying product name and manufacturer until time of use.

B. Storage And Handling Requirements:
   1. Follow Manufacturer’s recommendations including but not limited to following:
      a. Store in clean, dry location.

b. Keep containers sealed until ready for use.
c. Store materials at room temperature before use.
2. Protect materials during handling and placement to prevent damage or contamination.
a. Protect materials from freezing or overheating.
3. Shelf Life: One (1) year minimum in original, unopened containers.

1.5 FIELD CONDITIONS

A. Ambient Conditions:
1. General:
a. Do not place grout over frozen concrete.
2. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and Manufacturer's printed recommendations:
a. Do not install products under environmental conditions outside Manufacturer's recommendations.
3. Follow ACI requirements for cold and hot weather concreting or Manufacturer's written instructions, whichever is more stringent:
a. Cold Weather Limitations:
1) Follow requirements of ACI 306R for cold weather concreting.
b. Hot Weather Limitations:
1) Follow requirements of ACI 305R for hot weather concreting.
c. ACI 305R-10, 'Guide to Hot Weather Concreting'.
d. ACI 306R-10, 'Guide to Cold Weather Concreting'.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Design Criteria:
1. Description:
a. Commercial non-shrink, non-metallic grout.
2. Meet following requirements:
a. ASTM C1107/C1107M, Type B or Type C.
b. Corps and Engineers CRD C-621.
c. Compressive strength of 6000 psi (41 MPa) minimum.

B. Acceptable Products:
1. Masterflow 928 by BASF Systems, Shakopee www.buildingsystems.basf.com.
2. ProSpec F77 by Bonsal American, Inc., Charlotte, NC www.bonsal.com.
3. Advantage 1107 Grout by Dayton Superior Corporation, Oregon, IL www.daytonsuperiorchemical.com.
4. NS Grout by Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
5. Five Star Grout by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
6. Duragrout by L&M Construction Chemicals Inc., Omaha, NE www.lmcc.com.
7. Planigrout 712 by MAPEI Corporation, Deerfield Beach, FL www.mapei.US
8. SikaGrout 212 by Sika Corporation, Lyndhurst, NJ www.usa.sika.com
9. MP Grout by US Mix Products Company, Denver, CO www.usspec.com.
10. Sealtight CG-86 Grout by W R Meadows, Hampshire, IL www.meadows.com.
11. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Examine substrate and verify substrate is suitable for installation.
   2. Notify Architect of unsuitable conditions in writing.
      a. Do not install board over unsuitable conditions.
      b. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

A. Surface Preparation:
   1. Prepare concrete surfaces in accordance with Manufacturer's written instructions:
   2. Remove all loose materials.
   3. Clean surface of any substance that could interfere with bond on material including dirt, paint, tar, asphalt, wax, oil, grease, latex compounds, form release agents, laitance, loose toppings, foreign substances and any other residues.
   4. Saturate area to be grouted with water in accordance with Manufacturer's written instructions.

3.3 APPLICATION

A. General:
   1. Follow Manufacturer's recommended thickness.

B. Mixing:
   1. Mix grout in accordance with Manufacturer's written instructions.
   2. Add mix water in amount in accordance with Manufacturer's written instructions to provide required placing consistency.
   3. Do not add water in amount that will cause bleeding or segregation of mixed grout.
   4. Do not add any sand, cement, admixtures, or fluidifiers to grout.

C. Placement:
   1. Place grout in accordance with Manufacturer's written instruction including but not limited to the following:
      a. Proper curing is required.
      b. Use cold weather or hot weather grouting procedures in accordance with Manufacturer's written instructions, as temperature dictates:
         1) Do not use at temperatures that may cause premature freezing.
         2) Do not allow to freeze until 4000 psi (27.6 MPa) is attained.
      c. Employ cold weather or hot weather grouting practices as temperatures dictates.
   2. Completely eliminate air pockets and provide full contact between grout and item being grouted. Do not exceed Manufacturer's recommended thickness.

D. Curing:
   1. Cure grout in accordance with Manufacturer's written instructions or ACI curing practices.
   2. Wet cure grout until forms are removed.
   3. Seal grout surfaces after forms are removed as recommended by Manufacturer.

E. Keep grout surfaces wet after curing compound has dried for as long as recommended by Manufacture.

3.4 FIELD QUALITY CONTROL

A. Field Inspections:

1. Verify product has been installed as per Contract Documents and Manufacturer's written instructions.

B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

3.5 CLEANING

A. Use clean water.

B. Clean tools and equipment with water before material hardens.

3.6 PROTECTION

A. Follow Manufacturer's recommendation for protection when applying material.

B. Protect placed grout from freezing until minimum strength of 4000 psi (27.58 MPa) is reached.

C. Protect placed grout from damage during construction.

END OF SECTION

SECTION 04 22 00 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Supply and installation of all reinforced concrete unit masonry work (concrete unit masonry, mortar, grout, reinforcement, anchors, and ties) and accessories as shown on the drawings and herein specified.

B. Products installed but not furnished under this section:

1. Masonry veneer.

C. Structural notes indicated on the drawings regarding reinforced unit masonry shall be considered part of this specification.

1.2 RELATED WORK

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry.

C. Section 05 12 23 - Structural Steel.

D. Section 05 21 00 - Steel Joists.

E. Section 31 23 00 - Foundation Excavating and Backfilling.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
4. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
5. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
6. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
7. ASTM C387 - Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
8. ASTM C476 - Standard Specification for Grout for Masonry.

9. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
10. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
11. International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
12. TMS 402/602 - Building Code Requirements and Specifications for Masonry Structures.
13. UL - Underwriters Laboratories.

1.4 QUALITY ASSURANCE

A. Fire Resistance: Whenever a fire-resistant classification is indicated for unit masonry construction, provide concrete block units as tested and listed for the particular fire-resistant construction.

B. Perform the work in accordance with Chapter 21 of the California Building Code.

C. The governing building department reserves the right to take samples and make material tests prior to or during construction, without expense to the Contractor. Materials found to be defective shall be removed and replaced.

1.5 SUBMITTALS

A. Prepare and submit product data for the Engineer's approval. Data should include all horizontal reinforcement, anchoring devices, and all other embedded items herein specified.

B. Prepare and submit shop drawings detailing the fabrication, bending, and placement of reinforcing bars. Provide wall elevations showing reinforcement layout.

C. Samples: When requested by the Architect and before any materials are delivered to the Worksite, submit for approval one sample of the proposed masonry materials, showing the full range of colors and textures available.

D. Certificates:

1. Submit a letter of certification from the manufacturer of the concrete masonry units certifying all concrete masonry units delivered to the worksite are in strict conformance with the provisions of this specification.
2. Submit concrete unit masonry compressive strength test results demonstrating the units meet the specified strength. Test must be conducted by a qualified independent testing agency.

E. Submit mortar mix design and test results as follows:

1. Mix designs shall indicate type and proportions of ingredients in compliance with the proportion requirements of ASTM C270.

2. For mix designs not in accordance with the proportion requirements of ASTM C270, the mortar test history must be performed in accordance with ASTM C780 to verify performance with property requirements of ASTM C270. Tests must meet the type of mortar specified on the drawings. Tests must be done by a qualified independent testing agency.

F. Submit grout mix designs and test results as follows:

1. Mix designs shall indicate type and proportions of the ingredients in compliance with the proportion requirements of ASTM C476.
2. For mix designs not in accordance with the proportion requirements of ASTM C476, the grout test history must be performed in accordance with ASTM C1019 to verify performance with property requirements of ASTM C476. Tests must meet the type of grout specified on the drawings. Test must be done by a qualified independent testing agency.

    a. Perform one test prior to construction and perform at least one test during construction for each 5000 square feet of wall.

1.6 MOCKUP

A. Prior to installation of masonry work, erect sample wall panel to further verify color and texture characteristics of selected masonry units and mortar and to demonstrate the level of workmanship required for the unit masonry.

B. Construct mockup at the site, where directed. Mockup shall be full thickness four-foot high by four-foot long, including face and back-up wythes, as well as all accessories. Mockup shall indicate the proposed range of color, texture, and quality of workmanship to be expected in the completed work.

C. Obtain the Architect's acceptance of visual qualities of the mockup before start of masonry work.

D. Retain mockup during construction as a standard for judging completed masonry work.

E. Construct mockup panels for the following walls:

1. Exterior masonry wall construction.

F. Demolish and remove mockups from site when directed by the Architect/Engineer.

G. Mockups may remain as part of work when directed by the Architect/Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. All masonry units shall be delivered to the worksite and stacked on pallets to allow the circulation of air through all units. Cover with a waterproof covering anchored to prevent displacement during high winds.

B. Masonry accessories, including reinforcing steel, shall be stored clear of the ground to prevent deterioration or damage due to moisture, temperature changes, contaminants, and corrosion.

C. Deliver all materials in sufficient quantity and time to maintain approved construction schedule.

D. Deliver all packaged materials in manufacturer's original containers, with labels and markings intact and legible.

E. Immediately remove all damaged materials or containers from site and replace with new items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Masonry Units: ASTM C90, Grade N-1 as follows:

1. Weight: Normal weight or lightweight.
2. Compressive Strength: As indicated on the drawings.
3. Nominal Size: As indicated on the drawings.
4. Actual Size: 3/8" less than nominal size.
5. Aggregates:

    a. Normal Weight: ASTM C33.
    b. Lightweight: ASTM C331.

6. Provide special units for 90° corners, lintels jambs, sash, control joints, headers, bond beams, and other special conditions conforming to ASTM C90.
7. All exposed unit masonry shall be free of chips, cracks, and other imperfections.

B. Mortar and Grout:

1. Compressive Strength: As indicated on the drawings.
2. Mortar type for masonry construction shall be as designated in the General Notes of the drawings, conforming to ASTM C270, and grout shall conform to ASTM C476.
3. Portland Cement: ASTM C150, Type I, non-staining, no air entraining, natural color cement.
4. Blended Cement: ASTM C595.
5. Masonry Cement: ASTM C91.
6. Mortar Aggregate: ASTM C144, standard masonry type sand per California Building Code.
7. Hydrated Lime: ASTM C207.
8. Quicklime: ASTM C5, non-hydraulic type.
9. Premix Mortar: ASTM C387, using gray cement, normal strength.
10. Grout Aggregate: ASTM C404 Pea gravel with not more than 5% passing the No. 8 sieve and 100% passing the 3/8-inch sieve per the California Building Code.

11. Grout Fine Aggregate: Sand.
12. Water: Clean and potable.
13. Do not use calcium chloride in mortar or grout.

C. Joint Reinforcement:

1. Provide joint reinforcement formed from galvanized carbon-steel wire in accordance with ASTM A641, Class 1 for interior walls; and ASTM A153, Class B-2, for exterior walls.
2. Provide welded wire units prefabricated with 9 gauge deformed continuous side rods and 9 gauge plain cross rods into straight lengths of not less than 10 feet with matching corner and tee units. Unit widths to be 1-1/2 to 2 inches less than the wall thickness.
3. For multi-wythe concrete masonry walls, provide truss type reinforcement with a third side rod extending out into the other wythe.

D. Ties and Anchors:

1. Rigid wall anchors shall be fabricated of 1/4 inch thick mild steel, 1 inch wide by 24 inches long, with ends turned up.
2. Wall ties shall be corrugated 7/8 inch wide by 7 inches long, minimum 16 gauge galvanized steel.
3. Structural steel column anchor ties shall be adjustable weld-on 1/4 inch diameter steel rods and minimum 3/16 inch galvanized triangular shaped tie.
4. For anchorage to concrete, use dovetail sheet metal anchor sections and triangular shaped 16 gauge wire tie sections sized to extend within 1 inch of masonry face.

E. Reinforcement:

1. Use deformed billet bars with unprotected finish conforming to ASTM A615, 60 ksi yield strength.

F. Control and Expansion Joints:

1. Control joint material for unit masonry shall consist of cross-shaped extruded polyvinyl gaskets sized to match wall thickness.
2. Expansion or joint filler material, unless otherwise indicated, shall be 1/2 inch thick asphalt impregnated cellular board.
3. Compressible filler shall be pre-molded filler strips complying with ASTM D1056, Type 2, Class A, Grade 1; compressible up to 35 percent of width and thickness indicated.
4. Bond breaker strips shall be asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).

G. Breath wicks: 3/16 inch diameter cotton sash cord or glass fiber rope. Provide 2 inches of exposure to the outside and space wicks at 18 inches on center along the wall.

H. Insulation Board: Refer to Board Insulation in Division 7.

I. Masonry cleaners shall be non-acidic and not harmful to masonry workers or adjacent materials.

J. Bonding Agent: Larson Products Corporation "Plasterweld" as distributed by Pioneer Builder's Supplies, Inc. Los Angeles, California or approved equivalent.

K. Waterproofing Agent: "Red Label Suconem" by Sika Corporation or approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive work.

1. Verify foundations are constructed with tolerances conforming to the requirements of ACI 117.
2. Verify reinforcing dowels are positioned in accordance with the drawings.

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify built-in items are in proper location and ready for roughing into masonry work.

D. Beginning of installation means Installer accepts existing conditions.

3.2 PREPARATION

A. Layout walls in advance for accurate spacing of bond patterns, with uniform joint widths and to properly locate openings, expansion joints, and offsets.

B. Direct and coordinate placement of metal anchors supplied to other Sections.

C. The Contractor is responsible to design, provide, and install bracing that will ensure stability of masonry during construction. Maintain in place until building structure provides permanent bracing.

D. Remove laitance, loose aggregate, and anything else that would prevent mortar from bonding to the foundation.

E. Clean all reinforcement by removing mud, oil, or other materials that will adversely affect or reduce bond at the time mortar or grout is placed.

3.3 COLD WEATHER CONSTRUCTION

A. When ambient temperature is below 40°F, implement cold weather procedures.

B. Special cold weather requirements for various temperature ranges are as follows:

1. Air temperature 40°F to 32°F: Sand or mixing water shall be heated to produce mortar temperatures between 40°F to 120°F.

2. Air temperature 32°F to 25°F:

    a. Sand and mixing water shall be heated to produce mortar temperatures between 40°F to 120°F. Maintain temperature of mortar on boards above freezing.
    b. Grout aggregates and mixing water shall be heated to produce grout temperature between 70°F to 120°F.

3. Air temperature 25°F to 20°F: Comply with requirements for air temperature between 32°F to 25°F and the following:

    a. Provide heat sources on both sides of the wall under construction to heat masonry surfaces to 40°F. Windbreaks shall be used when wind is in excess of 15 miles per hour.
    b. Heat masonry to a minimum temperature of 40°F prior to grouting.

4. Air temperature 20°F and below. Comply with requirements for air temperature between 32°F to 20°F and the following:

    a. Enclosure and auxiliary heat shall be provided to maintain air temperature above freezing. Do not lay masonry units having a temperature below 20°F.

C. Cold-Weather Protection:

1. When the mean daily air temperature is 40°F to 25°F, masonry shall be completely covered for 24 hours with weather-resistive membrane.
2. When the mean daily air temperature is 25°F to 20°F, masonry shall be completely covered for 24 hours with insulating blankets with a weather-resistive covering. Extend time period to 48 hours for grouted masonry.
3. When the mean daily air temperature is 20°F or below, masonry temperature shall be maintained above freezing for 24 hours by enclosure and auxiliary heating. Extend time period to 48 hours for grouted masonry.

D. Do not lay masonry units having either a temperature below 20°F or containing frozen moisture, visible ice, or snow on their surfaces.

E. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing.

F. Top of all walls not enclosed or sheltered shall be covered with strong weather-resistive material at the end of each day or shutdown.

G. Partially completed walls shall be covered at all times when work is not in progress.

H. Any section of masonry deemed frozen and damaged shall be removed before continuing construction of that section.

I. Masonry units shall be dry at the time of placement. Wet or frozen units shall not be laid.

J. All cold weather masonry construction shall conform to TMS 402/602 Building Code Requirements and Specifications for Masonry Structures.

3.4 HOT WEATHER CONSTRUCTION

A. Hot weather construction is defined when:

1. The ambient air temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph.

B. Hot Weather Procedures:

1. Maintain sand piles in a damp, loose condition.
2. Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
3. Flush mixer, mortar transport container, and mortar boards with cool water before they come in contact with mortar ingredients or mortar.
4. Use mortar within two hours of initial mixing.
5. Fog spray all newly constructed masonry until damp, at least three times a day until the masonry is three days old.
6. Do not spread mortar beds more than 4 feet ahead of masonry. Set masonry within one minute of spreading mortar.

3.5 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement. Grouted cells shall be in vertical alignment.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in bond to match existing at all patch and infill locations.

D. Unless noted otherwise, provide masonry control joints at 30'-0" on center maximum.

E. Unless noted otherwise, build non-bearing interior partitions walls full height to underside of structure.

3.6 PLACING AND BONDING

A. Unless noted otherwise, construct masonry in running bond pattern.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Bed and Head Joints:

1. Unless otherwise required, construct 3/8 inch thick bed and head joints.
2. At foundation, construct bed joint of the starting course a thickness not less than 1/4 inch, and not more than 3/4 inch.
3. Unless otherwise noted, tool joint with a round jointer when the mortar is thumbprint hard.

4. Remove masonry protrusions extending 1/2 inch or more into cells or cavities to be grouted.
5. Where masonry rests on concrete, the concrete shall be sandblasted or bushed.

D. Collar Joints:

1. Unless otherwise required, solidly fill collar joints less than 3/4 inch wide with mortar as the job progresses.

E. Place hollow units as follows:

1. With face shells of bed joints fully mortared.
2. With webs fully mortared in:

    a. All courses of piers, columns, and pilasters.
    b. In the starting course on foundations.
    c. When necessary to confine grout or loose fill.
    d. When otherwise required.

3. With head joints mortared, a minimum distance from each face equal to the face shell thickness of the unit.
4. Vertical cells to be grouted are aligned and openings are unobstructed.

F. Place solid units as follows:

1. Unless otherwise required, solidly fill bed and head joints with mortar.
2. Do not fill head joints by grouting with mortar.
3. Construct head by shoving mortar tight against the adjoining unit.
4. Do not deeply furrow bed joints.

G. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

H. Remove excess mortar as work progresses.

I. Interlock intersections and external corners.

J. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

K. Perform job site cutting of masonry units with proper tools to provide straight, clean, undamaged edges. Prevent broken masonry unit corners or edges.

L. Isolate masonry partitions from vertical structural framing members with a control joint.

M. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler and pin top of wall with prefabricated partition anchors that allow vertical movement.

3.7 HORIZONTAL REINFORCEMENT AND ANCHORS

A. Install horizontal joint reinforcement as follows:

1. Interior non-load bearing walls - 24 inches on center vertically.
2. Exterior walls and interior load bearing walls - 16 inches on center vertically.
3. Parapet walls - 8 inches on center vertically unless noted otherwise.
4. Foundation walls - 8 inches on center vertically unless noted otherwise.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.

E. Place joint reinforcement so longitudinal wires are embedded in mortar with a minimum cover of 1/2 inch when not exposed to weather or earth, and 5/8 inch when exposed to weather or earth.

F. Anchor masonry to structural members where masonry abuts or faces such members.

G. Wall Ties:

1. Embed the ends of wall ties in mortar joints. Embed wall tie ends at least 1/2" into the outer face shell of hollow units. Embed wire wall ties at least 1-1/2" into the mortar bed of solid masonry units or solid grouted hollow units.
2. Do not bend wall ties after embedded in grout or mortar.
3. Unless otherwise required, install adjustable ties in accordance with the following requirements.

    a. One tie for each 1.77 square feet of wall area.
    b. Do not exceed 16 inches horizontal or vertical spacing.
    c. The maximum misalignment of bed joints from one wythe to the other is 1-1/4".
    d. The maximum clearance between connecting parts of the ties is 1/16".
    e. When pintle legs are used, provide ties with at least two legs made of wire size W2.8.
    f. Install wire ties perpendicular to a vertical line on the face of the wythe from which they protrude. Where one-piece ties or joint reinforcement is used, the bed joints of adjacent wythes shall align.
    g. Unless otherwise required, provide additional unit ties around all openings larger than 16 inches in either dimension. Space ties around the perimeter of an opening at a maximum of 3 feet on center. Place ties within 12 inches of an opening.

3.8 VERTICAL REINFORCEMENT

A. Support and secure reinforcing bars from displacement beyond the tolerances allowed by construction loads or by placement of grout or mortar. Maintain position within 1/2 inch of masonry unit or formed surface, but not less than 1/4 inch (only when fine grout is used).

B. Dowels in footings shall be set to align with cores containing reinforcing steel.

C. Place and consolidate grout fill without displacing reinforcing. Completely embed reinforcing bars in grout.

D. All cells containing reinforcing in concrete blocks shall be filled solid with grout.

E. Do not bend reinforcement after it is embedded in grout or mortar.

F. Reinforce masonry unit cores and cavities with vertical reinforcement bars and grout as indicated on the drawings. Place reinforcement and ties in grout spaces prior to grouting.

G. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters.

H. Place steel in walls and flexural elements within 1/2 inch of required location.

I. Place vertical bars within 2 inches of the required location along the length of the wall.

3.9 CONCRETE UNIT MASONRY

A. Lay masonry units with core cells vertically aligned and clear of mortar dropping, debris, loose aggregates, and any material deleterious to masonry grout.

B. Do not place grout until height of masonry to be grouted has attained sufficient strength to resist grout pressure.

C. Do not wet concrete masonry units before laying.

D. Grout spaces less than two inches in width with fine grout using low lift grouting techniques. Grout spaces two inches or greater in width with course grout using high lift or low lift grouting techniques.

E. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.

F. Grouting:

1. Place grout in lifts not to exceed five feet. Consolidate grout at time of placement.

    a. Consolidate grout pours 12 inches or less in height by mechanical vibration or by puddling.
    b. Consolidate grout pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

2. When the grout pour height exceeds 5 feet 4 inches, provide cleanout opening no less than 3 inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit. Opening should be of sufficient size to permit removal of debris.

3. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
4. Limit grout lift to 60 inches and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.10 GROUTING REINFORCED CONCRETE BLOCK WALLS

A. Provide reinforcing bars at indicated spacing and grout bars and voids solid with grout having a 28-day compressive strength as listed in the General Notes of the drawings.

3.11 GROUTING BLOCK CELLS BELOW LINTELS AND BEAMS

A. For lintel spans greater than 5'-0": Grout block cells 24 inches beneath the lintel and 24 inches each side of lintel.

3.12 LINTELS AND BOND BEAMS

A. Steel Lintels: Install steel lintels supplied from Division 5 of this specification. Provide a minimum of 8 inches of end bearing on each side of opening unless noted otherwise. All exterior exposed steel lintels shall be hot-dip galvanized in accordance with ASTM A123.

B. Bond Beams:

1. Use specially shaped lintel units at hollow masonry unit walls, with reinforcing bars as shown and filled with concrete grout.
2. Provide minimum 16 inches of end bearing at each side of opening.
3. Provide reinforced concrete block lintels over openings less than 3'-0" wide which are not scheduled.
4. Place and consolidate concrete without disturbing the reinforcing.
5. Allow lintels to reach 100 percent of their design strength before removing temporary supports.
6. Do not place vertical control joints above bond beams or within 16 inches each side of bond beam.

3.13 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints except above wall openings.

B. Provide vertical expansion, control, and isolation joints as indicated on the drawings. If joints are not indicated, then provide control joints at a maximum spacing of 30'-0".

C. Install all built-in masonry accessory items as work progresses.

D. Exposed joints to be tooled slightly concave and concealed joints to be struck flush. Use a 3/4-inch diameter round tool for making 1/2-inch joints.

1. Bed Joints: Not less than 3/8-inch and not more than 2-inch thick.
2. Head Joints: To match bed joints.

E. Rake out mortar where sealants are shown or required.

3.14 BUILT-IN WORK AND EMBEDDED ITEMS

A. As work progresses, build in metal door and glazed frames, fabricated metal lintels, anchor bolts, plates, and other items furnished by other Sections.

B. Place pipes and conduits passing horizontally through masonry beams or masonry walls in steel sleeves or cored holes.

C. Install pipes and conduits passing horizontally through non-bearing masonry partitions.

D. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories.

E. Do not embed aluminum conduits, pipes, and accessories in masonry, grout, or mortar, unless effectively coated or covered to prevent aluminum-cement chemical reaction or electrolytic action between aluminum and steel.

F. Build in items plumb and level.

G. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

H. Do not build in organic materials subject to deterioration.

3.15 PREFABRICATED CONCRETE AND MASONRY ITEMS

A. Erect prefabricated concrete and masonry items in accordance with the requirements.

3.16 TOLERANCES

A. Comply with tolerances in the MSJC Specification and the following:

1. Maximum variation from alignment of columns and pilasters: 1/4 inch.
2. Maximum variation from unit to adjacent unit: 1/32 inch.
3. Maximum variation from plane of wall: 1/4 inch in 10 feet and 3/8 inch in 20 feet or more.
4. Maximum variation from plumb: 1/4 inch per story non-cumulative.
5. Maximum variation from level coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
6. Maximum variation of bed joint thickness: 1/8 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and structural members. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain the Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 CLEANING

A. Remove excess mortar and mortar smears.

B. Replace defective mortar.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Clean exposed masonry surfaces of all stains, efflorescence, mortar or grout droppings, and debris.

F. Where new masonry wall surfaces remain stained or defaced by mortar or any other foreign matter to a degree not acceptable to the Owner, clean surfaces by a light sandblasting at no added cost. Avoid damaging masonry surfaces and joints during sandblasting operations.

3.19 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners that may be damaged by construction activities.

B. Water Repellent Coating:

1. Apply sufficient coats of the approved material to achieve a consistent and uniform appearance, free from runs and sags, and with a uniformly resistive surface that will prevent penetration of water through the walls for the required period of warranty.
2. Twenty days after completion of the portion of the Work, and as a condition of its acceptance, demonstrate by running a water test showing it will successfully repel water.

   a. Notify the Engineer at least 72 hours in advance and conduct the test in the Engineer's presence.
   b. By means of an outrigger or similar acceptable equipment, place the nozzle of a 3/4" garden hose at a point approximately 10 feet away from the top of the wall, aiming the nozzle at a slight downward angle to direct the full stream of water onto the wall.
   c. Run the water onto the wall at full available force for not less than 4 hours.
   d. Upon completion of the 4-hour period, inspect the interior surfaces of the wall for evidence of moisture penetration.

3. If evidence of moisture penetration is discovered, apply an additional coat of the water repellent material to the exterior surface in areas directed by the Engineer, repeating the application and the testing, at no additional cost to the Owner, until no evidence of moisture penetration is found.

END OF SECTION

SECTION 04 0501

COMMON MASONRY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common requirements and procedures for Masonry including:
      a. References.
      b. Definitions.
      c. Joint backing for masonry control joints and masonry expansion joints.
      d. Testing and Inspection for providing specific testing and inspections and Field Tests and Inspections administrative requirements for masonry.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
   2. Section 01 4523: 'Testing And Inspection Services' for testing, inspections, special testing, special inspections, and testing laboratory services for materials, products, and construction methods.
   3. Section 07 9213: 'Elastomeric Joint Sealants' used with masonry joints.
   4. Sections Under 04 0000 Heading: 'Masonry':
      a. Pre-installation conference held jointly with other masonry related sections including:
         1) Section 04 0513: 'Cement and Lime Masonry Mortaring'.
         2) Section 04 0516: 'Masonry Grouting'.
         3) Section 04 0519: 'Masonry Anchors And Inserts'.
         4) Section 04 2223: 'Architectural Concrete Unit Masonry'.

1.2 REFERENCES

A. Concrete Masonry Association of California and Nevada

B. Definitions:
   1. Cold Weather: as referred to in this Section, is four (4) hours with ambient temperature below 40 deg F (4.4 deg C) in twenty-four (24) hour period.
   2. Efflorescence: Deposit or encrustation of soluble salts, generally white and most commonly consisting of calcium sulfate that may form on surface of stone, brick, concrete, or mortar when moisture moves through and evaporates on masonry. Often caused by free alkalies leached from mortar, grout, adjacent concrete, or in clays. Test for efflorescence is described in ASTM C67 and CAN/CSA A82.
   3. Flashing:
      a. Flashing: Thin impervious material placed in mortar joints and through air spaces in masonry to prevent water penetration and/or provide water drainage.
      b. Flexible Flashing: Water-proof material typically used in cavity wall construction to contain and assist in proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
      c. Foundation Flashing: Same as flexible flashing.
      d. Head And Sill Flashing: Same as flexible flashing.
      e. Through-Wall Flashing: Generally considered same as flexible flashing.
   4. Hot Weather: as referred to in this Section, is ambient air temperature above 100 deg F (38 deg C) or ambient air temperature above 90 deg F (32 deg C) with wind velocity 8 mph (13 kph) or greater.
   5. Masonry Joints:

a. Masonry Control Joint: Determines location of movement in concrete masonry walls that is due to volume changes resulting from shrinkage. Vertical control joint is vertical gap through concrete masonry wythe and filled with inelastic materials. Joint backing with sealant is used on exterior side of control joint to prevent water and air penetration. Concrete masonry generally shrinks over time.
b. Masonry Expansion Joint. Expansion joint separates brick masonry walls into segments to prevent cracking caused by changes in temperature, moisture expansion, elastic deformation, settlement and creep. Joints are formed by leaving continuous unobstructed opening through brick wythe that may be filled with highly compressible material. Joint backing with sealant is used on exterior side of expansion joint to prevent water and air penetration. Brick masonry generally expands over time.

C. Reference Standards:
1. ASTM International:
a. ASTM D2000-18, 'Standard Classification for Rubber Products in Automotive Applications'.
b. ASTM D2240-15, 'Standard Test Method for Rubber Property-Durometer Hardness'.
c. ASTM D2287-12, 'Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds'.
2. California Building Code (CBC) (2016 or latest approved edition):
a. Chapter 17, 'Special Inspections And Tests':
1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
2) Section 1705, 'Required Special Inspection And Tests':
a) Section 1705.2, 'Steel Construction'.
b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
3. The Masonry Society (TMS):
a. TMS 402/602-16, 'Building Code Requirements and Specification for Masonry Structures'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate work with other trades with items to be built into masonry such as electrical switches and plumbing faucets.

B. Pre-Installation Conference:
1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conferences:
a. Conduct conference at Project site.
b. Schedule pre-installation conference during construction of mockup panel.
2. In addition to agenda items specified in Section 01 3100, review following:
a. Review storage and handling requirements.
b. Review cold and hot weather procedure requirements.
c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections.
1) Review requirements and frequency of testing and inspections.
2) Review specific testing and inspections and field test requirements as specified in Unit Masonry Sections.

C. Scheduling:
1. Concrete Unit Masonry:
a. Structural Mortar and Grout:
1) Notify Testing Agency and Architect twenty-four (24) hours minimum before placing masonry units, reinforcing, mortar and/or grout.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: As specified in each masonry section.
   2. Samples: As specified in each masonry section.

1.5 QUALITY ASSURANCE

A. Testing And Inspection:
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Testing and Inspection for structural masonry (prisms, units, mortar, and grout):
      a. Owner will employ testing agencies to perform testing and inspection for structural masonry as specified in Field Quality Control in Part 3 of this specification:
         1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
         2) See Section 01 1200: 'Multiple Contract Summary'.

B. Scheduling:
   1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing mortar.
   2. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing grout.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
   1. Check, carefully unload, and deliver material to site in such manner as to avoid soiling, damaging, or chipping.
   2. Do not use damaged masonry units, damaged components of structure, or damaged packaged materials.
   3. Masonry Accessories: Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Aggregate:
      a. Store different aggregates separately.
      b. Store on high ground, or ideally, off ground to prevent contamination from dirt, organic materials and ground water, any of which may contribute to efflorescence and may be deleterious to mortar performance.
      c. Store under protective cover to avoid saturation and freezing in cold weather.
   2. Cementitious material:
      a. Store in such manner as to prevent deterioration or intrusion of foreign material or moisture.
      b. Do not use cementitious materials that have become contaminated.
      c. Protect from precipitation and groundwater.
         1) Store materials on elevated platforms, under cover, and in dry location.
         2) Do not use cementitious materials that have become damp or has become unsuitable for good construction.
   3. Masonry accessories:
      a. Store masonry accessories clear of ground, including metal items, to prevent corrosion and contamination by dirt and ground water which may contain soluble salts and other matter which may contribute to efflorescence and staining.
      b. Plastic and asphalt coated flashing material should not be stored in areas exposed to sunlight. During installation, flashing must be pliable so that no cracks occur at corners or bends.
      c. Protect from damage until installation.
   4. Masonry units:

a. Store materials protected from exposure to harmful weather conditions as directed by manufacturer.
b. Store material on planks clear of ground which may contain soluble salts and protect from damage, dirt, or disfigurement.
c. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof membrane, securely tied. If units become wet, do not install until they are dry.

5. Masonry Reinforcement:
   a. Protect reinforcement, ties, and metal accessories from permanent distortions, elements and store off ground.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Mortar:
      a. Ideal mortar temperature is 70 deg F ± 10 deg F (21 deg C ± 6 deg C). Mixing temperature should be maintained within 10 deg F (6 deg C).
   2. Cold Weather Requirements. Implement approved cold weather procedures and comply with requirements contained in TMS 402/602 including but not limited to following:
      a. Preparation requirements (prior to conducting masonry work):
         1) Do not lay masonry units having either temperature below 20 deg F (minus 7 deg C) or containing frozen moisture, visible ice, or snow on their surface.
         2) Do not use frozen materials or materials mixed or coated with ice or frost. Keep materials free of ice and snow. Do not lay masonry on frozen material. Remove and replace unit masonry damaged by frost or by freezing conditions.
         3) Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.
         4) Preparation of mortar.
      b. Construction requirements (work in progress and based on ambient air temperature):
         1) Do not heat water or aggregates used in mortar or grout above 140 deg F (60 deg C). Comply with cold weather requirements for ambient air temperatures prior to conducting masonry work in accordance with TMS 402/602.
   3. Hot Weather Requirements. Implement approved hot weather procedures and comply with requirements contained in TMS 402/602 including but limited to following:
      a. Preparation (prior to conducting masonry work). Comply hot weather procedures when:
         1) Ambient air temperature exceeds 100 deg F (37.8 deg C), or exceeds 90 deg F (32.2 deg C) with wind velocity greater than 8 mph (12.9 kph).
         2) Ambient temperature exceeds 115 deg F (46.1 deg C), or exceeds 105 deg F (40.6 deg C) with wind velocity greater than 8 mph (12.9 kph).
      b. Construction requirements (work in progress). Comply hot weather procedures when prior to conducting masonry work in accordance with TMS 402/602.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Masonry Control Joints:
   1. Description:
      a. Extruded rubber or PVC.
      b. Joint backing (backer rod).
      c. Elastomeric joint sealant.
   2. Design Criteria:
      a. Extruded Rubber:
         1) Meet requirements of ASTM D2000 2AA-805.
      b. PVC:

1) Meet requirements of ASTM D2287 (Type PVC 654-4) with durometer hardness of 85 (+ or -5) when tested in accordance with ASTM D2240.

c. Acceptable Products:
1) RS standard rubber control joint by Hohmann & Barnard.
2) VS standard PVC control joint by Hohmann & Barnard.
3) Equals as approved by Architect.

B. Masonry Expansion Joints:
1. Description:
a. Closed Cell Neoprene Sponge without tear strip placed horizontally beneath relieving angle, or in vertical expansion joint to act as control joint.
b. Joint backing (backer rod).
c. Elastomeric joint sealant.
2. Design Criteria:
a. Extruded Rubber:
1) Meet requirements of ASTM D1056 Grade 2A1.
b. Acceptable Products:
1) NS neoprene sponge by Hohmann & Barnard.
2) Equals as approved by Architect.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
1. Unit Masonry:
a. Tests and Inspections are required as specified in Sections under Heading 04 2000 'Unit Masonry'.

END OF SECTION

SECTION 04 0513

CEMENT AND LIME MASONRY MORTARING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of masonry mortar used on Project.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 04 0501: 'Common Masonry Requirements'.
   4. Sections Under 04 2000 Heading: Furnish and install mortar.

1.2 REFERENCES

A. Definitions:
   1. See Section 04 0501: 'Common Masonry Requirements' for common masonry definitions.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C144-18, 'Standard Specification for Aggregate for Masonry Mortar'.
      b. ASTM C150/C150M-18, 'Standard Specification for Portland Cement'.
      c. ASTM C207-18, 'Standard Specification for Hydrated Lime for Masonry Purposes'.
      d. ASTM C270-14a, 'Standard Specification for Mortar for Unit Masonry'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501: 'Common Masonry Requirements'.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals:
      a. If pre-mixed wet mortar or pre-blended dry mortar mix are to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
      b. If site mixed / blended mortar is to be used, provide written description of proposed method of measuring and mixing of materials.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Inspecting Reports.

1.5 QUALITY ASSURANCE

A. Testing And Inspection:

1. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
   1. As specified in Section 04 0501: 'Common Masonry Requirements'.

B. Storage And Handling Requirements:
   1. Cementitious material:
      a. As specified in Section 04 0501: 'Common Masonry Requirements'.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Design Criteria:
   1. Mixing:
      a. Meet either proportion or property specifications of ASTM C270 for masonry mortar as per Table 3 'Proportion Specifications' and Table 4 'Physical Requirements for Masonry Cement Mortars'.
      b. Conform with requirements of ASTM C780 and ASTM C1586.
      c. Machine mixing should be used whenever possible.
   2. Mortar Minimum Compressive Strength at twenty-eight (28) days:
      a. Type S: 1800 psi (12.4 MPa).
         1) Concrete Unit Masonry (CMU):

B. Materials:
   1. Portland Cement:
      a. Meet requirements of ASTM C150/C150M and ASTM C270.
   2. Hydrated Lime:
      a. Meet requirements of ASTM C207 for hydrated lime.
   3. Aggregate:
      a. Meet requirements of ASTM C144 and ASTM C270.
   4. Water:
      a. Clean and free of acids, alkalis, and organic materials.
   5. Admixtures:
      a. Use no admixtures.

C. Mixes:
   1. General:
      a. Heat water and sand to 140 deg F (60 deg C) maximum if temperature is below 40 deg F (4.4 deg C).

   2. Unit Masonry for mortar as specified in each Masonry specification section:
      a. Proportions of ingredients in compliance with proportion specification of ASTM 270 using Portland cement.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Field tests and inspection as specified in 04 0501: 'Common Masonry Requirements'.
   2. Sampling and testing of mortar is not required.

END OF SECTION

SECTION 04 0516

MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of masonry grout used on Project.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 04 0501: 'Common Masonry Requirements'.
   4. Sections under 04 2000 heading: Furnish and install masonry grout.

1.2 REFERENCES

A. Definitions:
   1. See Section 04 0501 for common masonry definitions.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C143/C143M-15a, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
      b. ASTM C404-18, 'Standard Specification for Aggregates for Masonry Grout'.
      c. ASTM C476-18, 'Standard Specification for Grout for Masonry'.
      d. ASTM C1019-18, 'Standard Test Method for Sampling and Testing Grout'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals:
      a. If pre-blended dry grout is to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
      b. If grout is to be mixed in field, provide written description of proposed procedure for measuring and mixing of materials.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Inspecting Reports.

1.5 QUALITY ASSURANCE

A. Testing And Inspection:
   1. As specified in Section 04 0501.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
   1. As specified in Section 04 0501.

B. Storage And Handling Requirements:
   1. Cementitious material:
      a. As specified in Section 04 0501.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Design Criteria:
   1. Provide grout that conforms to requirements of ASTM C476 and TMS 402/602.

B. Materials:
   1. Proportions of Ingredients:
      a. Grout proportions shall be determined by one of following methods:
         1) As per ASTM C476 Table 1: 'Grout proportions by Volume' for fine and coarse grout.
         2) Specified Compressive Strength: Proportions established by twenty-eight (28) day compressive strength tests in accordance with Test Method ASTM C1019 that obtain specified compressive strength:
            a) Grout shall be mixed to slump of 8 to 11 inches (200 to 280 mm) as determined by Test Method ASTM C143/C143M and shall have minimum compressive strength of 2000 psi (14 MPa) at 28 days.
   2. Production Methods: Grout shall be produced using one of following procedures:
      a. Materials mixed at job site:
         1) Individual cementitious materials and aggregates stored at job site shall be mixed in mechanical mixer for minimum of five (5) minutes with sufficient water to achieve desired consistency.
         2) Individual dry ingredients transported to job site in suitable compartments shall be mixed with water at job site using continuous volumetric proportioning equipment to achieve desired consistency. Mix with auger of appropriate length to provide adequate mixing.
      b. Mixed materials transported to job site:
         1) Factory dry-blended cementitious materials and aggregates delivered to job site shall be mixed in mechanical mixer for minimum of five (5) minutes with sufficient water to achieve desired consistency.
         2) Wet-mixed grout shall arrive at job site in ready-mixed condition. Slump shall be adjusted as necessary, and grout shall be re-mixed at mixing speed for at least one minutes before discharging to achieve desired consistency.
      c. Grout may be hand mixed on small jobs with written approval of mixing procedure by Architect.
   3. Portland Cement:
      a. Meet requirements of ASTM C94/C94M, ASTM C150/C150M and ASTM C476.
   4. Aggregate:
      a. Meet requirements of ASTM C144, ASTM C404, and ASTM C476.
   5. Water: Clean and potable free of acids, alkalis, and organic materials.
   6. Admixtures:

a. No additives are allowed which will increase air entrainment. Other additives may be used as approved in writing by Architect before use.

7. Antifreeze Compounds:
   a. No antifreeze liquids, salts or other substances shall be used in grout to lower freezing point.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Field tests and inspection as specified in 04 0501: 'Common Masonry Requirements'.

END OF SECTION

SECTION 04 0519

MASONRY ANCHORS AND INSERTS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Embedded Anchors for masonry.
   2. Post Installed Drilled Anchors for masonry:
      a. Adhesive anchors and inserts.
      b. Drilled-in mechanical anchors (expansion bolts).
      c. Screw anchors.
   3. Masonry anchors and inserts not specified elsewhere.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
   2. Section 01 4000: ‘Quality Requirements’ for administrative and procedural requirements for quality assurance and quality control.
   3. Section 01 4523: ‘Testing and Inspecting Services’ for post installed Drilled-In Anchor testing and inspection, and testing laboratory services for materials, products, and construction methods.
   4. Section 04 0501: ‘Common Masonry Requirements’ for installation of masonry anchors and inserts.
   5. Section 04 0523: ‘Masonry Accessories’.
   6. Sections Under 04 2000 Heading: ‘Unit Masonry’ for masonry anchors and inserts used in Unit Masonry.

1.2 REFERENCES

A. Reference Standards:
   1. American Concrete Institute:
      a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
      b. ACI 355.4M-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary (Metric)'.
      c. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
   2. ASTM International:
      a. ASTM A36/A36M-14, ‘Standard Specification for Carbon Structural Steel’.
      b. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength'.
      c. ASTM A563-15, ‘Standard Specification for Carbon and Alloy Steel Nuts'.
      d. ASTM E488/E488M-18, ‘Standard Test Methods for Strength of Anchors in Concrete Elements’.
      e. ASTM F3125/F3125-15a, ‘Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
   3. International Code Council (IBC) (2018 or latest edition available):
      a. Chapter 17, ‘Special Inspections And Tests’:
         1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Inspection shall be performed according to Manufacturer’s submitted ICC ES Evaluation Report.

2. Notify Testing Agency and Architect twenty-four (24) hours minimum before testing Post Installed Drilled Anchors. Coordinate testing schedule with mortar and grout as specified in Section 04 0501.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Post Installed Anchors:
         1) Manufacturer's product literature for each item.

B. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Post Installed Anchors:
         1) Provide current Manufacturer's applicable ICC ESR Evaluation Reports and ICC ES Acceptance Criteria showing conformance for each item.
   2. Manufacturer's Instructions:
      a. Post Installed Anchors:
         1) Manufacturer's published installation instructions for each item.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Post Installed Anchors:
            a) Testing Agency Inspecting Reports of Anchors.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Having sufficient capacity to produce and deliver required materials without causing delay in work.
   2. Installer:
      a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.

B. Testing and Inspection.
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Testing and Inspection for Post Installed Anchors:
      a. Owner will employ testing agencies to perform testing and inspection for anchors as specified in Field Quality Control in Part 3 of this specification.
         1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
         2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufactured Units:
   1. General:
      a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
      b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
      c. Conform to requirements of ASTM F3125/F3125M for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.

B. Embedded Anchor Bolts:
   1. Quality Standard. See Section 01 6200.
      a. Meet following design criteria requirements:
         1) Bent-bar Anchors: J and L-Bolts (threaded steel rods with hooks embedded into masonry):
            a) Non-headed type threaded 2 inches (50 mm) minimum conforming to material requirements of ASTM A36/A36M.
            b) Anchor hook to project 2 inch (50 mm) minimum including bolt diameter.
         2) Headed Bolts:
            a) Headed type threaded 2 inch (50 mm) minimum conforming to requirements of ASTM A307, Grade A.

C. Post Installed Anchors (Concrete Masonry Unit (CMS):
   1. Design Criteria:
      a. Design loads are determined from testing minimum of five (5) specimens in accordance with ASTM E488 under stresses and conditions that represent intended use.
         1) Allowable stress design values are limited to twenty (20) percent of average tested anchor bolt strength.
         2) Using strength design provisions, nominal design strengths are limited to sixty-five (65) percent of average tested strength.
      b. Effective embedment length: 2 inch (50 mm) minimum.
   2. Adhesive Anchors:
      a. Cartridge Injection Adhesive Anchors.
      b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 58 for masonry.
      c. Rod diameter and embedment length as indicated on Contract Drawings.
      d. Acceptable Products:
         1) HIT-HY 70 by Hilti Fastening Systems, Tulsa, OK; www.us.hilti.com.
         2) SET Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
         3) Equal as approved by Architect before installation. See Section 01 6200.
   3. Drilled-In Mechanical Anchors (Expansion Bolts):
      a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 01 for masonry.
      b. Acceptable Products:
         1) Kwik Bolt 3 by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
         2) Wedge-All by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
         3) Equal as approved by Architect before installation. See Section 01 6200.
   4. Screw Anchors:
      a. Provide anchors with length identification markings conforming to ICC ES AC 106 for masonry.
      b. Acceptable Products:
         1) Titen HD by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
         2) Equal as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
      a. Base Material Strength:
         1) Unless otherwise specified, do not drill holes in masonry until mortar, or grout has achieved full design strength.
      b. Identify position of reinforcing steel and other embedded items before drilling holes for anchors.
      c. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
      d. Take precautions as necessary to avoid damaging, electrical and telecommunications conduit, and gas lines.
      e. Notify Architect/Engineer if reinforcing steel or other embedded items are encountered during drilling.

3.2 PREPARATION

A. Surface Preparation:
   1. Clean surfaces prior to installation.
   2. Prepare surface in accordance with Manufacturer's written instructions.

3.3 INSTALLATION

A. Embedded Anchor Bolts:
   1. Embed Headed and J Bolts larger than 1/4 inch (6.4 mm) diameter in grout that is placed in accordance with 'Grout Placement' as specified in Installation requirements in Part 3 of this specification. Anchor bolts of 1/4 inch (6.4 mm) diameter or less are permitted to be placed in grout.
   2. For anchor bolts placed in top of grouted cells and bond beams, maintain clear distance between bolt and face of masonry unit of at least 1/4 inch (6.4 mm) when using fine grout and at least 1/2 inch (12.7 mm) when using coarse grout.
   3. For anchor bolts placed through face shell of hollow masonry unit, drill hole that is tight-fitting to bolt or provide minimum clear distance:
   4. For portion of bolt that is within grouted cell, maintain clear distance between bolt and face of masonry unit and between head or bent leg of bolt and formed surface of grout of at least 1/4 inch (6.4 mm) when using fine grout and at least 1/2 inch (12.7 mm) when using course grout.
   5. Place anchor bolts with clear distance between parallel anchor bolts not less than nominal diameter of anchor bolt, nor less than 1 inch (25 mm).

B. Post Installed Anchors (Concrete Masonry Unit (CMS):
   1. General:
      a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
      b. Unless otherwise shown on Contract Drawings, drill holes perpendicular to masonry surface.
      c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cores holes may only be used if acceptable to Manufacturer.
      d. Perform anchor installation in accordance with Manufacturer's published instructions.
   2. Adhesive Anchors:
      a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's instructions to ensure proper mixing of adhesive components.
      b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
      c. Remove excess adhesive from surface.
      d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.

e. Observe Manufacturer's instructions with respect to installation temperatures for adhesive anchors. Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.

3. Drilled-in Mechanical Anchors (Expansion Bolts):
   a. Protect threads from damage during anchor installation.
   b. Set anchors to Manufacturer's recommended torque, using torque wrench. Following attainment of ten (10) percent of specified torque, one hundred (100) percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
4. Screw Anchors:
   a. Protect threads from damage during anchor installation.
   b. Set anchors to Manufacturer's recommended torque, using torque wrench.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
   1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
      a. Quality Control is sole responsibility of Contractor.
         1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
            a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
   2. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
      a. Certified Inspector from Testing Agency shall verify procedures used for installation of all post installed anchors and monitor their installation for compliance with manufacturer's requirements.
      b. Testing: Ten (10) percent of each type and size of drilled-in anchor shall be proof loaded by Testing Agency's testing laboratory or as directed by Architect. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than ten (10) percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at Contractors expense, unless otherwise instructed by Architect.
         1) Torque will be applied with calibrated torque wrench.
         2) Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed D/10, where D is nominal anchor diameter.

B. Non-Conforming Work:
   1. Remove and replace misplaced or malfunctioning anchors.
   2. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect.
   3. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.
   4. Repair damage to adjacent materials caused by product installation.

3.5 CLEANING

A. Waste Management:
   1. Disposal of rubbish, debris, and packaging materials.

3.6 PROTECTION

A. General:
   1. Protect installed products from damage during construction.

END OF SECTION

SECTION 04 0520

MASONRY REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Masonry horizontal joint reinforcing.
   2. Steel reinforcing bars.

B. Related Requirements:
   1. Sections under Division 03 'Concrete' for placement of dowels out of foundations for masonry reinforcing.
   2. Section 04 0501: 'Common Masonry Requirements' for installation of masonry reinforcing.
   3. Sections under 04 2000 Heading: 'Unit Masonry' for masonry units using masonry reinforcing.

1.2 REFERENCES

A. Reference Standards:
   1. ACI 117-10(R2015): 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.

B. Definitions:
   1. See Section 04 0501 for common masonry definitions.

C. Reference Standards:
   1. ASTM International:
      a. ASTM A153/A153M-16, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
      b. ASTM A615/A615M-16, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.
      c. ASTM A951/A951M-16, 'Standard Specification for Steel Wire for Masonry Joint Reinforcement'.
      d. ASTM A1064/A1064M-16b, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Certificates:
      a. Mill certificate.
   2. Fabricator Instructions:
      a. Reinforcing bar placement drawings.

1.4 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
   1. Steel reinforcing bars shall be free of heavy rust scales and flakes, and other bond-reducing coatings at time of delivery and placing.
   2. Separate steel reinforcing bars by size and tag with manufacturer's heat or test identification number.

3. Tag continuous joint reinforcing with Manufacturer's name, wire size, and ASTM / CSA specification.

B. Storage And Handling Requirements:
1. Properly protect reinforcing on site after delivery.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Manufacturers Contact List:
a. Heckman Building Products Inc, Chicago, IL www.heckmannbuildingprods.com.
b. Hohmann & Barnard, Hauppauge, NY www.h-b.com.
c. Masonry Reinforcing Corporation of America, Charlotte, NC www.wirebond.com.

B. Materials:
1. Design Criteria:
a. Steel Reinforcing Bars:
1) Steel reinforcing bars shall have grade identification marks and meet requirements of ASTM A615/A615M, Grade 60 minimum. All but No. 2 bars shall be deformed type.

C. Fabrication:
1. Fabricate and bend steel reinforcing bars according to 'ACI Detailing Manual' (2004 edition or latest available) and as detailed on Contract Drawings.
2. Reinforcement:
a. Fabricate reinforcing bars in accordance with fabricating tolerances of ACI 117.
b. Bend bars cold and do not heat bars.
c. Do not bend Grade 40 bars in excess of 180 degrees. Minimum inside diameter of bend is five bar diameters.
d. Minimum inside bend diameter for other bars is as follows:
1) No. 2 through No. 8 (M #10 through M #25): 6 bar diameters.
2) No. 9 through No. 11 (M #29 through M #36): 8 bar diameters.
e. Provide standard hooks that conform to following:
1) Standard 180-degree hook: 180-degree bend plus minimum extension of 4 bar diameters or 2-1/2 inch (64 mm), whichever is greater.
2) Standard 90-degree hook: 90-degree bend plus minimum extension of 12 bar diameters.
3) For stirrups and tie hooks for No. 5 (M #l6) bar and smaller: 90-degree or 135-degree bend plus minimum of 6 bar diameters or 2-1/2 inch (64 mm), whichever is greater.

2.2 ACCESSORIES

A. Rebar Positioners (Used with structural CMU construction):
1. Design Criteria:
a. Position rebar vertically in cell of CMU.
b. Cold-drawn steel conforming to ASTM A1064/A1064M.
c. Wire diameter: 9 gauge (1.48 inch or 3.7 mm).
d. Finish: Hot-dipped galvanized as per ASTM A153/A153M (1.5 oz/ft (42.5 grams/305 mm).
2. Quality Standards:
a. Single Curtain: No. RB Rebar Positioners by Hohmann & Barnard.
b. Double Curtain: No. RB-Twin Rebar Positioners by Hohmann & Barnard.
3. Acceptable Manufacturers:
a. Heckman Building Products Inc, Chicago, IL www.heckmannbuildingprods.com.
b. Hohmann & Barnard, Hauppauge, NY www.h-b.com.
c. Masonry Reinforcing Corporation of America, Charlotte, NC www.wirebond.com.

d. Equal meeting Design Criteria as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
1. Coordinate with Division 03 'Concrete'.

B. Reinforcement
1. Basic requirements:
   a. Place reinforcement in accordance with the sizes, types, and locations indicated on Contract Drawings and as specified.
   b. Do not place dissimilar metals in contact with each other.
   c. Reinforcing shall be free of material that may destroy bond.
   d. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing
   e. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar, beyond allowable tolerances.
   f. Unless accepted by Architect, do not bend reinforcement after it is embedded in grout or mortar.
2. Placing Reinforcement:
   a. Completely embed reinforcing bars in grout in accordance with 'Grout Placement' as specified in Installation requirements in Part 3 of Section 04 0501: 'Common Masonry Requirements'.
   b. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing.
   c. Maintain clear distance between reinforcing bars and interior of masonry unit or formed surface of at least 1/4 inch (6.4 mm) for fine grout and 1/2 inch (12.7 mm) for coarse grout,
   d. Place reinforcing bars maintaining the following minimum cover:
      1) Masonry face exposed to earth or weather:
         a) 2 inch (50.8 mm) for bars larger than No. 5 (M #16).
         b) 1-1/2 inch (38.1 mm) for No. 5 (M #16) bars or smaller.
   e. Maintain minimum clear distance between parallel bars of the nominal bar size or 1 inch (25.4 mm), whichever is greater.
   f. In columns and pilasters, maintain minimum clear distance between vertical bars of one and one-half times nominal bar size or 1-1/2 inch (38.1 mm), whichever is greater.
   g. Continue bond beam units and reinforcement uninterrupted around corners and across wall intersections. See Contract Drawings.
3. Splicing:
   a. Splice reinforcing steel as shown on Contract Drawings.
   b. Noncontact lap splices: Position bars spliced by noncontact lap splice no farther apart transversely than one-fifth specified length of lap nor more than 8 inch (200 mm).
4. Rebar Positioners:
   a. Before grouting, secure masonry reinforcing steel in place before grouting with rebar positioners at top of first course and bottom of top course minimum.
   b. Install intermediary positioners for every 192 bar diameters maximum between positioners.
   c. Locate intermediary positioners with approximately equidistant spacing in wall when number required has been determined.
5. Joint Reinforcement (Single-Wythe Unit Masonry):
   a. Beginning approximately 8 inch (203 mm) from base of masonry, provide joint reinforcing 16 inches (400 mm) on center vertically, except 8 inch (203 mm) on center if drip crimped unless noted otherwise in Contract Drawings.
   b. Place joint reinforcement so that longitudinal wires are embedded in mortar with minimum cover of 1/2 inch (12.7 mm) when not exposed to weather or earth; or 5/8 inch (15.9 mm) when exposed to weather or earth.
   c. Provide minimum 6 inch (150 mm) lap splices for joint reinforcement.
   d. Ensure that all ends of longitudinal wires of joint reinforcement at laps are embedded in mortar or grout.

6. Placement tolerances:
   a. Place reinforcing bars in walls and flexural elements within tolerance of ± 1/2 inch (12.7 mm) when:
      1) Distance from centerline of reinforcing bars to opposite face of masonry is equal to 8 inch (203 mm) or less.
      2) ± 1 inch (25.4 mm) for centerline of reinforcing bars to opposite face of masonry equal to 24 inch (610 mm) or less but greater than 8 inch (203 mm).
      3) ± 1-1/4 inch (32 mm) for centerline of reinforcing bars to opposite face of masonry greater than 24 inch (610 mm).
   b. Place vertical bar within:
      1) 2 inch (50.8 mm) of required location along length of wall when wall segment length exceeds 24 inch (610 mm).
      2) 1 inch (25 mm) of required location along length of wall when wall segment length does not exceed 24 inch (610 mm).
   c. If it is necessary to move bars more than one (1) bar diameter or distance exceeding tolerance stated above to avoid interference with other reinforcing steel, conduits, or embedded items, notify Architect for acceptance of resulting arrangement of bars.
   d. Foundation dowels that interfere with unit webs are permitted to be bent to maximum of 1 inch (25 mm) horizontally for every 6 inch (150 mm) of vertical height.

3.2 CLEANING

A. Waste Management:
   1. Disposal of rubbish, debris, and packaging materials.

END OF SECTION

SECTION 04 2223

ARCHITECTURAL CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install architectural concrete unit masonry as described in Contract Documents.
   2. Furnish and install anchor bolts and embedded anchors as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Anchor bolts.
   2. Elastomeric joint sealants.
   3. Grout.
   4. Mortar.
   5. Reinforcement bars.

C. Related Requirements:
   1. Section 03 2100: ‘Reinforcement Bars’.
   2. Section 04 0501: ‘Common Masonry Requirements’ for:
      a. Common masonry requirements and procedures.
      b. Pre-installation conference held jointly with other masonry related sections.
   3. Section 04 0513: 'Cement and Lime Masonry Mortaring' for quality of mortar.
   4. Section 04 0516: 'Masonry Grouting' for quality of grout.
   5. Section 04 0519: 'Masonry Anchors and Inserts' for anchor bolts used in masonry.
   6. Section 07 1900: 'Water Repellent' for sealing masonry after cleaning.
   7. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

A. Definitions:
   1. Section 04 0501: ‘Common Masonry Requirements’ for:
      a. Common Masonry Terms.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C90-16a, 'Standard Specification for Loadbearing Concrete Masonry Units'.
      b. ASTM C331/C331M-17, 'Standard Specification for Lightweight Aggregates for Concrete Masonry Units'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Certificates:
      a. Prior to construction, certificates for materials used in masonry construction indicating compliance with contract documents are to be submitted. This is “Unit Strength Method” approach.
   2. Source Quality Control Submittals:
      a. Manufacturer's certification that units meet compressive strength specified requirements.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:

a) Testing Agency Testing and Inspecting Reports.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
a. Minimum of five (5) years' experience on successfully completed projects of similar nature.

B. Testing And Inspection:
1. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
1. As specified in Section 04 0501: 'Common Masonry Requirements'.

B. Storage And Handling Requirements:
1. Aggregate, Cementitious Material, Masonry Accessories, Masonry Units, and Reinforcement:
a. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Cold Weather and Hot Weather Limitations:
a. As specified in Section 04 0501: 'Common Masonry Requirements'.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Design Criteria:
1. Minimum Compressive Strength of (2000 psi 13.8 MPa).

B. Materials:
1. Concrete Masonry Units:
a. Concrete Masonry Units conforming to ASTM C90
b. Colors & Textures
1) Precision CMU – Equal to Orco Medium Weight Precision CMU, Integral Color
2) Splitface CMU – Equal to Orco Medium Weight Split Face Integral Color
3) Insulated CMU – Equal to Orco Spec Precision
2. Mortar: Type 'S' mortar as specified in Section 04 0513: 'Cement and Lime Masonry Mortaring'.
3. Concrete Masonry Units:
a. Design Criteria:
1) Meet requirements of ASTM C90, lightweight classification:
a) 85 lbs per cu ft (1 362 kg per cu meter) minimum weight classification.
b) Lightweight aggregates conforming to ASTM C331/C331M.
c) Do not use re-crushed masonry units as aggregate.
2) Outside Corners: Square-edged, except where bull nose is indicated on Contract Drawings.
3) Use special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, etc, as required.
4) Uniform color and textures with unbroken edges. Smooth face, except where shown otherwise on Contract Drawings.

2.2 ACCESSORIES

A. Construction Cleaning Compounds:
   1. Acceptable Products:
      a. 202 or 202V by Diedrich Technologies, Oak Creek, WI www.diedrichtechnologies.com.
      b. Surekleen No. 600 or Vana-Trol by ProSoCo Inc, Kansas City, KS www.prosoco.com.
      c. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Verify substrates have been properly prepared.
   2. Verify built-in items are in proper location, and ready for roughing into masonry.
   3. Notify Architect of any unsatisfactory preparation before proceeding.
      a. Do not install masonry over unsuitable conditions.
      b. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

A. Coordinate placement of reinforcement, anchors and accessories, flashings and weep holes and other moisture control products specified in other sections.

B. Prior to placing masonry:
   1. Clean reinforcement by removing mud, oil, or other materials that will adversely affect or reduce bond at time mortar or grout is placed.
   2. Remove laitance, loose aggregate, and anything else that would prevent mortar from bonding to foundation.

C. Wetting Masonry Units:
   1. Concrete masonry:
      a. Do not wet concrete masonry units before laying. Wet cutting is permitted.

D. Reinforcement:
   1. Place reinforcement and ties in grout spaces prior to grouting.

E. Provide temporary bracing during installation of masonry work:
   1. Design, provide, and install bracing that will assure stability of masonry during construction.
   2. Maintain bracing in place until building structure provides permanent support.

3.3 INSTALLATION

A. Interface With Other Work:
   1. Masonry Cutting:
      a. Make cuts proper size to accommodate work of other trades.
      b. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
      c. Replace unit masonry in which larger than necessary openings are cut.
      d. Do not patch openings with mortar or other material.

B. General:
   1. Cold Weather and Hot Weather Limitations:
      a. Place grout and mortar as specified in Section 04 0501: ‘Common Masonry Requirements’.
   2. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
   3. Step back unfinished work for joining with new work. Use toothing only with Architect's approval.
   4. Built-In Work:

a. As work progresses, install masonry flashings and weep holes and other built-in work specified in other sections.

C. Tolerances:
1. Masonry work shall be true to vertical and horizontal planes within 1/8 inch (3 mm) in 10 feet (3 meters), non-cumulative.
2. Maintain 3/8 inch (9.5 mm) mortar joints throughout.
3. Grout space or cavity width, except for masonry walls passing framed construction: minus 1/4 inch (6.4 mm), plus 3/8 inch (9.5 mm).

D. Mortar:
1. Use mortar within two (2) hours of initial mixing. Discard mortar that has begun to set. Set masonry units within one (1) minute of spreading mortar.
2. Do not allow mortar build-up in cavity between brick veneer and Concrete Masonry Units (CMU).

E. Grouting:
1. General:
a. Provide grout that conforms to requirements as specified in Section 04 0516: 'Masonry Grouting'.
b. Use fine grout for cavities 2 inches (50 mm) and smaller in smallest dimension. Use coarse grout for cavities greater than 2 inches (50 mm) in smallest dimension.
c. Grout hollow metal door frames installed in masonry walls solid.
d. Provide grout-leveling bed for support of wall plates.
2. Concrete Masonry Units:
a. Fully grout cells containing reinforcing bars.
b. Consolidate grout by means of mechanical vibrator. Do not use cell reinforcing to rod grout.
c. Before loss of plasticity, mechanically reconsolidate grout.
3. Placing time:
a. Place grout within 1-1/2 inches (38 mm) introducing water in the mixture and prior to initial set:
1) Discard site-mixed grout that does not meet specified slump without adding water after initial mixing.
2) For ready-mixed grout:
a) Addition of water is permitted at time of discharge to adjust slump.
b) Discard ready-mixed grout that does not meet specified slump without adding water, other than water that was added at time of discharge.
c) Time limitation is waived as long as ready-mixed grout meets specified slump.
4. Confinement:
a. Confine grout to areas indicated on Contract Drawings. Use material to confine grout that permits bond between masonry units and mortar.
5. Grout Pour Height:
a. Place grout in 48 inch (1 200 mm) maximum lifts.
6. Consolidation:
a. Consolidate grout at the time of placement:
1) Consolidate grout at time of placement in height by mechanical vibration or by puddling.
2) Consolidate pours exceeding 12 inch (305 mm) in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
b. Consolidation or reconsolidation is not required for self-consolidating grout.
7. Grout Key:
a. When grouting, form grout keys between grout pours. Form grout keys between grout lifts when first lift is permitted to set prior to placement of subsequent lift:
1) Form grout key by terminating grout minimum of 1-1/2 inch (38 mm) below mortar joint.
2) Do not form grout keys within beams.
3) At beams or lintels laid with closed bottom units, terminate grout pour at bottom of beam or lintel without forming grout key.

F. Laying:
1. Layout:
a. Running bond except where indicated otherwise.

2. Joints:
   a. Tool concave. Fill completely except where indicated differently.
   b. Do not tool until mortar has taken initial set.
   c. Point holes in joints. Fill and tool properly.
3. Concrete Masonry Units:
   a. Lay hollow masonry units dry. Do not lay masonry on frozen material.
   b. Place hollow units so:
      1) Face shells of bed joints are fully mortared.
      2) Webs are fully mortared in all courses of piers, columns and pilasters and when necessary to confine grout or insulation.
      3) Head joints are mortared, minimum distance from each face equal to face shell thickness of unit.
      4) Vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with Contract Drawings.
   c. Align cells or cavities to preserve unobstructed cavity for grouting:
      1) Do not allow excess mortar to block cells.
      2) Full bedding required on both webs and face shell under first course. Other courses need only face shell bedding except where bedding is needed to control flow of grout.

G. Reinforcing:
1. Reinforcing shall be free of material that may destroy bond.
2. Continuous Joint Reinforcing:
   a. Beginning approximately 8 inches (200 mm) from base of masonry, provide joint reinforcing 16 inches (400 mm) on center vertically, except 8 inches (200 mm) on center if drip crimped.
   b. Maximum offset between brick and block coursing is 1-1/4 inch (32 mm) using ladder adjustable-wire reinforcement or ladder adjustable-wire reinforcement with seismic hook type reinforcing. If brick and block coursing is exactly lined up, ladder adjustable-wire reinforcing may be used. However, such reinforcing may not be bent to fit coursing that does not line up.
   c. Lap splices and intersections minimum of 6 inches (150 mm).
3. Reinforcing:
   a. Place steel as shown on Contract Drawings.
   b. Splice 48 bar diameters minimum.
   c. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing.
   d. Place horizontal bars in 8 inch (200 mm) deep bond beam units at top of wall and at 48 inches (1 200 mm) on center between. Continue bond beam units and reinforcement uninterrupted around corners and across wall intersections.
   e. Place special vertical bars of same size as normal vertical reinforcement at corners and jambs of openings and recesses where bond beams are interrupted and at beam bearing locations not otherwise detailed.
   f. Unless detailed otherwise, place special horizontal bars of same size as normal reinforcing above and below openings. Extend bars 24 inches (600 mm) minimum beyond opening.
4. Rebar Positioners:
   a. Before grouting, secure masonry reinforcing steel in place with rebar positioners at top of first course and bottom of top course minimum.
   b. Install intermediary positioners for every 192 bar diameters maximum between positioners.
   c. Locate intermediary positioners with approximately equidistant spacing in wall when number required has been determined.

H. Embedded items and accessories:
1. Install embedded items and accessories as follows:
   a. Construct chases as masonry units are laid.
   b. Install pipes and conduits passing horizontally through masonry partitions.
   c. Place pipes and conduits passing horizontally through piers, pilasters, or columns.
   d. Place horizontal pipes and conduits in and parallel to plane of walls.
   e. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories.
   f. Install movement (control and expansion) joints.
   g. Provide control joints as shown on Contract Drawings if included for Project.
   h. Aluminum:

1) Do not embed aluminum conduits, pipes, and accessories in masonry, grout, or mortar, unless they are effectively coated or isolated to prevent chemical reaction between aluminum and cement or electrolytic action between aluminum and steel.

3.4 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
1. Unit Masonry:
a. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
1) Quality Control is sole responsibility of Contractor.
a) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
(1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
b. Masonry (Masonry Units, Reinforcement, Mortar and Grout):
1) Testing and Inspections shall conform to IBC Section 17 'Special Inspections And Tests' and in accordance with Chapter 3 'Quality And Construction' of TMS 402/602, 'Building Code Requirements and Specification for Masonry Structures':
a) Quality assurance program shall comply with requirements of Chapter 3, for Level A 'Quality Assurance' for Risk Category I, II, or III structures or Level B 'Quality Assurance' for Risk Category IV structures and as defined in ASCE 7 or latest approved adopted building code. See Structural Design Criteria as shown on Contract Documents.

B. Non-Conforming Work:
1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

3.5 CLEANING

A. General:
1. Clean exposed masonry surfaces of stains, efflorescence, mortar and grout droppings, and debris using methods that do not damage masonry.
2. After mortar has hardened, wet masonry and clean with specified cleaning compound. Use stiff fibered brush for application. Rinse masonry surfaces with water immediately after cleaning. Leave masonry clean, free of mortar daubs, and with tight mortar joints.
3. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloth.
4. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

B. Waste Management:
1. Unit Masonry:
a. Clean up masonry debris and remove from site.

3.6 PROTECTION

A. General:
1. Brace masonry walls until walls attain adequate strength and are tied into building structure.
2. Do not allow structural loading of masonry walls until walls attain adequate strength.
3. During construction, all walls should be kept dry by covering top of wall with strong, water-resistant membrane at end of each day or shutdown period. Covering should overhang wall by at least 24 inches (610 mm) on each side, and should be secured against wind.
4. Covering should remain in place until top of cavity wall is completed or protected by adjacent materials.
5. Protect masonry with covering during rainy weather.

B. Cold Weather Requirements:

1. In cold weather, all materials and walls should be properly protected against freezing including storing of materials, preparation of mortar, heating of masonry units, laying precautions, and protection of Work.
2. Remove all masonry deemed frozen or damaged.

END OF SECTION

SECTION 05 12 23 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and erection of structural steel work, as shown on the drawings and specified herein. Work shall include, but not be limited to the following items:

1. Structural steel.
2. Base and bearing plates.
3. Deck support angles and framing for roof openings.
4. Steel lintel members for masonry openings.
5. Edge angles and bent plates.
6. Connection plates.
7. Shear stud connectors.
8. Architecturally Exposed Structural Steel (AESS).
9. All other steel items as listed in AISC - "Code of Standard Practice for Steel Buildings and Bridges" as shown on structural and architectural drawings.

B. Work shall also include grouting of all structural steel members where indicated.

C. Structural notes indicated on the drawings regarding structural steel framing should be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 05 05 23 - Welding.

D. Section 05 21 00 - Steel Joists.

E. Section 05 31 00 - Steel Deck.

F. Section 05 40 00 - Cold-Formed Steel Framing Systems.

G. Section 05 50 00 - Metal Fabrications.

H. Section 05 51 00 - Metal Stairs.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AISC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
2. AISC - Specification for Structural Joints Using High-Strength Bolts.
3. AISC 303 - Code of Standard Practice for Buildings and Bridges.
4. AISC 341-16 - Seismic Provisions for Structural Steel Buildings, including any Supplements.
5. AISC 358-16 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.
6. AISC 360-16 - Specification for Structural Steel Buildings.
7. ASTM A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
8. ASTM A36 - Standard Specification for Carbon Structural Steel.
9. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
10. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
11. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
12. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
13. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
14. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
15. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
16. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
17. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
18. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
19. ASTM A992 - Standard Specification for Steel for Structural Steel Shapes.
20. ASTM A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
21. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
22. ASTM E94 - Standard Guide to Radiographic Examination Using Industrial Radiographic Film.
23. ASTM E165 - Standard Practice for Liquid Penetrant Examination for General Industry.
24. ASTM E709 - Standard Guide for Magnetic Particle Testing.
25. ASTM F436 - Standard Specification for Hardened Steel Washers.
26. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
27. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
28. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
29. AWS D1.1 - Structural Welding Code - Steel.

30. AWS D1.8 - Structural Welding Code - Seismic Supplement.
31. California Building Standards Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2 (including all supplements).
32. SSPC - Steel Structures Painting Council.

1.4 QUALITY ASSURANCE

A. Fabrication, Erection, and Welding Qualifications:

1. Fabricate structural steel members in accordance with AISC Specification for the design, fabrication, and erection of structural steel for buildings.
2. All welding of structural steel shall be performed by operators who have been recently qualified as prescribed in "Qualification Procedures" of the American Welding Society (AWS).Refer to Section 05 05 23.
3. Information provided on paper-based contract documents will govern over information provided via electronic model transfer.
4. Tolerances: Tolerances shall be as indicated by the AISC Code of Standard Practice for Buildings and Bridges, except that tolerances for fabricating, rolling, cambering and erection shall not be cumulative.

1.5 SUBMITTALS

A. Shop Drawings:

1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval, including framing plans indicating size, weight, and location of all structural members. Shop drawings shall indicate methods of connecting, anchoring, fastening, bracing, and attaching work of other trades.

    a. Where contract documents indicate verify in field (VIF) dimensions, shop drawings shall indicate these dimensions and Contractor shall note the dimensions have been verified.
    b. This specification modifies AISC Code of Standard Practice by deleting the following sentence from 4.4.1(c): "Release by the Owner's Designated Representatives for Design and Construction for the Fabricator to begin fabrication using the approved submittals." Review of the shop drawings by the Engineer shall not relieve the fabricator of this responsibility.

2. Furnish both the Engineer and Architect with one copy of the following:

    a. Final shop drawings containing all review notations.
    b. Field Use/For Construction drawings.

3. The steel fabricator shall submit a setting plan for all embedded items for Engineer's approval.
4. Welder's Certification: Submit certification for all welders employed on the project demonstrating they have been AWS qualified to perform the welding procedures required for this project.

5. General Contractor/Construction Manager to provide copies of field concrete cylinder breaks indicating the concrete meets 75% of the design compressive strength to the steel erector.

B. The General Contractor/Construction Manager shall conduct a field survey of as-built anchors and bearing plate locations and elevations prior to steel erection. Survey shall be furnished to the steel fabricator. Contractor shall identify deviations from approved shop drawings and submit proposed repairs and modifications to the Engineer and steel fabricator for approval.

C. Product Data:

1. Certified copies of material test reports, commonly called mill test reports, for all structural steel used on the project. Material test reports shall comply with the requirements of ASTM A6, shall cover chemical and physical properties, and shall be accompanied by a Certificate of Compliance from the fabricator.
2. Manufacturer specifications, certifications, and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with these specifications:

    a. High strength bolts, including nuts and washers.
    b. Unfinished bolts and nuts

3. The Contractor shall submit written procedures for the pre-installation testing, installation, snugging, pretensioning, and post-installation inspection of fasteners. The procedure(s) shall meet all requirements of the RCSC specification and the drawings. Procedures need to be submitted only for the method(s) of installation to be used by the Contractor, which may include the turn-of-nut, calibrated wrench, twist-off type tension control bolt, and direct tension indicator methods.
4. Shear Stud Connectors: Contractor shall submit the following:

    a. Certifications that the studs, as supplied, meet the requirements of AWS D1.1, Sections 7.2 and 7.3.
    b. Certified copies of the stud manufacturer's test reports covering the last completed set of in-plant quality control mechanical tests for the diameter supplied.
    c. Certified material test reports from the steel supplier indicating diameter, chemical properties, and grade on each heat number supplied.
    d. Certificate of Compliance from the Contractor.

5. Prepare and submit product data for Engineer's approval for, expansion and/or adhesive anchors, non-shrink grout.

1.6 DELIVERY, STORAGE AND HANDLING

A. Steel members shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Materials should be stored to allow easy access for inspection and identification. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of the ground and in such a manner as to eliminate excessive handling.

B. Store fasteners in a protected location. Clean and re-lubricate bolts and nuts before use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:

1. All structural steel shall be free from defects impairing strength, durability, or appearance. All structural steel shall meet the latest minimum requirements as follows:

a. Structural steel wide flange shapes shall:

1) Conform to the ASTM designations listed in the General Notes of the drawings, unless noted otherwise.
2) "Heavy Sections" (hot-rolled shapes) shall be supplied with Charpy V-Notch (CVN) testing in accordance with ASTM A6, Supplementary Requirement S30, Charpy V-Notch Impact Test for Structural Shapes - Alternate Core Location. "Heavy Sections" (plates for built-up sections) shall be supplied with Charpy V-North (CVN) testing in accordance with ASTM A6, Supplementary Requirement S5, Charpy V-Notch Impact Test. The test shall meet a minimum average value of 20 ft-lbs absorbed energy at +70°F. Testing shall be in accordance with the current AISC Specification. Steel shall be manufactured using fully killed fine grain practice yielding grain size numbers 5 or greater as determined by ASTM E112.
3) All "Heavy Section" column flanges located at welded moment connections shall be ultrasonically examined, prior to welding, for evidence of laminations, inclusions, or other discontinuities in accordance with ASTM A435 or ASTM A898 as applicable and along beams, 6 inches past the end of the joint assembly. The area to be tested is a zone 6 inches above and below each beam flange connection. For plates, any discontinuity causing a total loss of back reflection that cannot be contained within a circle the diameter of which is 3 inches, or one-half the plate thickness, whichever is greater, shall be rejected.
4) If beams in the Seismic-Force-Resisting-System (SFRS) are moment-connected to the weak axis of the column, the column web shall be similarly examined to the above criteria.
5) Shapes of ASTM A572, Grade 50, mill certified to AISC Technical Bulletin #3 requirements, may be substituted for A992 with approval from the Structural Engineer.
6) Grade 50 steel shall have a minimum yield stress of 50 ksi and the yield stress, F_y, that is reported from tests shall be based on the yield strength definition in ASTM A370, using the offset method at 0.002 strain.

b. Structural steel angles, channels, bars, plates and miscellaneous steel shall conform to the ASTM designations listed in the General Notes of the drawings.
c. Square and rectangular structural tubing shall be cold formed conforming to the ASTM designations listed in the General Notes of the drawings.
d. Round structural tubing shall be cold formed conforming to the ASTM designations listed in the General Notes of the drawings.
e. Steel pipe shall conform to the ASTM designations listed in the General Notes of the drawings.

B. High Strength Structural Bolts:

1. High strength structural bolts shall conform to the ASTM designations listed in the General Notes of the drawings.
2. High strength bolts shall be detailed and installed in accordance with AISC - "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
3. High strength bolts shall be detailed and installed in accordance with AISC - "Specification for Structural Joints Using High-Strength Bolts."
4. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.

C. Anchoring Devices:

1. Anchor Rods: Anchor rods used with structural steel members shall be plain threaded rods conforming to the ASTM designations listed in the General Notes of the drawings.
2. Expansion Anchors: Expansion anchors shall consist of one-piece wedge type carbon steel anchors with heavy-duty nuts and washers. All components shall be zinc plated in accordance with ASTM B633. Refer to the drawing details and General Notes for the expansion anchors used as the basis of design and the acceptable alternates.
3. Adhesive Anchoring System: Adhesive anchoring system shall consist of a threaded anchor rod complete with nut and washer and the adhesive cartridge. Refer to the drawing details and General Notes for the adhesive anchoring systems used as the basis of design and the acceptable alternates.

a. Nuts shall meet ASTM A563, Grade DH, and washers shall meet ASTM F436.
b. All components shall be zinc plated in accordance with ASTM B633 SC1.
c. Adhesive shall consist of a two-part acrylic based adhesive applied in a dual cartridge dispensing system that properly mixes the components at the point of application.

D. Welding Materials:

1. Type required for material being welded in conformance with AWS D1.1.

E. Steel Stud Connectors:

1. For threaded studs that are being used to connect steel beams to embed plates, use ASTM A108, Type A, Grades 1010 through 1020 forged steel, headed uncoated with a minimum tensile strength of 61,000 psi. Fabricated within the tolerances set forth in AWS D1.1.
2. For shear connectors that are being used on steel beams in concrete slabs for composite shear transfer and embedded steel members, use ASTM A108, Type B, Grades 1010 through 1020 forged steel, headed uncoated with a minimum tensile strength of 65,000 psi. Fabricated within the tolerances set forth in AWS D1.1
3. Studs applied by means of the electric arc welding process and shall use an arc shield ferrules of heat resistant ceramic.

F. Galvanizing: Where indicated on the drawings, steel shall be galvanized by the hot-dip process after fabrication conforming to ASTM A123. All exterior steel that will remain exposed shall be galvanized, unless otherwise indicated.

G. Paints and Primers:

1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer.
2. Galvanizing repair paint: SSPC Paint 20.
3. Refer to Specification Section 09 90 00 for additional paint requirements.

H. Non-Shrink Grout for Base and Bearing Plates: Non-shrink grout, conforming to ASTM C1107, shall be pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sand, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents. All constituents shall meet the requirements of these specifications. Minimum compressive strength at 28-days shall be 7,000 psi as determined by ASTM C109. Follow manufacturer's instructions for handling, mixing, placing, and curing. Acceptable products are:

1. Euclid Chemical Company - Euco N.S. Grout
2. L&M Construction Chemical - Crystex.
3. Master Builders - Masterflow 713.
4. Sonneborn - Sonnogrout.
5. Five Star Products Inc. - Five Star Grout.
6. Dayton Superior - Sure-Grip High Performance Grout.
7. Dayton Superior - 1107 Advantage Grout.

2.2 FABRICATION AND MANUFACTURE

A. Fabrication Procedures (non-AESS):

1. Fabricate all structural steel items in accordance with AISC Specifications and as indicated on the approved shop drawings.
2. Provide camber in structural members where indicated.
3. Properly mark materials for field assembly and location for which intended. Fabricate for delivery sequence that will expedite erection and minimize handling of materials.
4. Complete structural steel assemblies before shop priming or galvanizing.

B. Shop Connections:

1. All shop connections shall be welded, unless noted otherwise on drawings. Connections shall develop the full strength of the adjoining members unless detailed otherwise.
2. All holes shall be either drilled or punched, as no burning of holes will be permitted, including the enlargement of holes. Provide all holes required for connections and for attaching the work of other trades where such holes are shown if furnished prior to fabrication.
3. Connections shall be detailed as standard framed beam connections (bearing type) in accordance with the AISC Manual of Steel Construction. Connections which require oversized holes or slotted holes in which the force is other than normal to the axis of the slot shall be detailed as "Slip-Critical Connections" and noted as such on the erection drawings. Provide bearing plates and end anchorage for beams resting on masonry.
4. All full and partial penetration welds shall be fully detailed on the shop drawings. Use backing for all full penetration welds.
5. Weld access holes shall be fabricated in accordance with the recommendations of AWS D1.1 and AISC Specification.

C. Steel Stud Connectors:

1. Steel stud shear connectors shall be securely welded in the field to structural steel beams as detailed on the drawings. Welds shall be such that the stud connector will deform before weld failure occurs. Welding shall be done in accordance with AWS D1.1.
2. Steel stud connectors for embedded plates and angles shall be welded in the fabrication shop in accordance with AWS D1.1.

D. Deck support framing and seats: Furnish all miscellaneous framing necessary to fully support the roof and floor steel decking.

E. Shop Priming:

1. Unless noted otherwise below, structural steel shall not be shop primed.
2. The following are steel surfaces to receive shop priming:

    a. Surfaces to be painted per Architect's drawings.

3. If the steel pieces are to be shop primed, the following surfaces are exceptions to shop priming:

    a. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
    b. Surfaces to be field welded.
    c. Surfaces to be high-strength bolted with slip-critical connections.
    d. Top flanges of beams supporting composite steel decking.
    e. Surfaces to receive sprayed fire-resistive materials.
    f. Galvanized surfaces.

4. Surface Preparation: Clean Surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

    a. SSPC-SP 3, "Power Tool Cleaning."
    b. SSPC-SP 14/NACE No. 8 "Industrial Blast Cleaning"

5. Priming: Apply primer in accordance with paint manufacturer's recommendations, and at a rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

F. Finished Paint System for Exposed Structural Steel: Structural steel exposed to the elements of weather shall be painted as follows:

1. Apply one coat of steel primer in shop as specified above.
2. Apply two coats of alkyd enamel paint to a minimum dry film thickness of 1.5 mils for each coat. Paint shall be applied according to the manufacturer's recommendations.
3. Paint shall be free of sags, runs, drips or other defects. Allow ample drying time before handling to prevent damage to coatings.

G. Galvanizing:

1. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.

    a. Fill vent holes and grind smooth after galvanizing.
    b. Unless otherwise noted on drawings or in Division 9, all exterior steel components exposed to the elements shall be galvanized, including, but not limited to, lintels.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Erection Procedures:

1. The erector and not the Structural Engineer shall be responsible for the means, methods, and safety of erection of the structural steel framing.
2. Erection of all structural steel items shall meet the requirements of AISC "Specification and Code of Standard Practice."

3. All work shall be erected square, plumb, straight and true, accurately fitted and with tight joints and intersections, by mechanics experienced in the erection of structural steel. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
4. Clean the bearing surface and other surfaces that will be in permanent contact before assembly.
5. All base plates shall be supported on steel wedges, steel shims or heavy-duty leveling nuts until the supported members have been leveled and plumbed.

    a. Snug tighten anchor rods after supported members have been positioned and plumb. Do not remove wedges or shims but, if protruding, cut off flush with edge of base plate before packing with grout.
    b. Promptly place non-shrink grout between bearing surfaces and base plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturers written installation instructions for shrinkage-resistant grouts.

6. Field connections of structural work shall be made with either high strength bolts (bearing type) or by welding. Proper precaution shall be taken to ensure anchored items will not be distorted or overstressed due to improperly fabricated items.
7. Splice members only where indicated unless, with the Structural Engineer's approval, splices not indicated would result in lower costs due to reduced shipping expense. For splices not indicated, submit structural calculations prepared under direct supervision of and signed by a Professional Structural Engineer licensed in the state where the project is located.
8. Do not use thermal cutting during erection unless approved by the Engineer/Architect in writing.
9. Steel erection shall not proceed without concrete in footings, piers, and walls attaining 75% of the intended minimum compressive design strength. Documentation must be provided indicating compliance with this requirement.

B. Surveys:

1. Establish permanent benchmarks necessary for accurate erection of structural steel.
2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.

C. Bracing and Protection:

1. Steel shall be well plumbed, leveled and braced to prevent any movement.

    a. Contractor shall provide and maintain all necessary temporary guying of steel frame to safely resist all wind and construction loads during erection and to assure proper alignment of all parts of the steel frame.

2. Provide all temporary flooring, bracing, shoring and guards necessary to prevent damage or injury. All partially erected steel shall be secured in an approved manner during interruptions of work.

D. Anchor and Foundation Rods:

1. All anchor or foundation rods and similar steel items to be built into concrete or masonry are to be set by the concrete or masonry contractors and shall be furnished promptly so they may be built in as the work progresses because cutting of structural steel members to accommodate errors pertaining to embedded items will not be permitted.

3.3 FIELD WELDING

A. Welding Procedures:

1. All field welding shall be in accordance with AISC Specifications and conform to AWS D1.1 "Structural Welding Code - Steel".

a. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Contractor shall remove ceramic ferrules from shear stud connectors in sufficient time to allow for inspection of welds prior to placement of the concrete.

3.4 REPAIRS, PROTECTION, AND TOUCH UP

A. Repair damaged galvanized coatings and on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Touch up Painting: After installation, promptly clean, prepare, and prime or reprime field welds, final connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of the same type as shop primer used on adjacent surfaces.
3. Secure approval by the Architect prior to field painting.

3.5 GROUTING

A. Grouting under structural framing members shall be completed after all members have been plumbed and braced and before imposed loads are placed thereon.

B. Remove all defective concrete, dirt, oil, grease, and other foreign matter from surfaces to which grout will be placed.

3.6 MISCELLANEOUS STEEL AND STEEL LINTELS

A. Furnish and install all miscellaneous steel as detailed in architectural and structural drawings.

B. The steel fabricator shall furnish all steel lintels required for masonry wall construction indicated in the architectural and structural drawings and schedules.

C. Provide additional steel framing for continuous support of steel deck edges at openings and column interruptions.

D. All exterior exposed steel shall be hot-dip galvanized in accordance with ASTM A123.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED STEEL FRAMING (CFSF) SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Load bearing structural steel stud, joist framing system of 18 to 12-gauge (43 mil to 97 mil) members along with fasteners and related accessories. Furnish and install cold-form steel framing, as shown on the drawings and specified herein. Work shall include, but not be limited to the following items:

1. Bearing and non-load bearing formed steel stud exterior wall and interior bearing wall framing.
2. Formed steel joist framing and bridging.
3. Provide tracks, blocking, lintels, clips angles, bridging, shoes, reinforcements, fasteners, and accessories to construct a complete steel framing system.

B. Structural notes indicated on the drawings regarding cold-formed steel framing system shall be considered a part of this Specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 05 12 23 - Structural Steel.

C. Section 05 21 00 - Steel Joists.

D. Section 05 31 00 - Steel Deck.

E. Section 06 10 00 - Rough Carpentry.

F. Division 9 for non-load bearing studs of 20 gauge (33 mil) or lighter.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
2. AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions.
3. AISI S202 - North American Standard for Cold-Formed Steel Structural Framing.
4. AISI S210 - North American Standard for Cold-Formed Steel Framing - Floor and Roof System Design.

5. AISI S211 - North American Standard for Cold-Formed Steel Framing - Wall Stud Design.
6. AISI S212 - North American Standard for Cold-Formed Steel Framing - Header Design.
7. AISI S213 - North American Standard for Cold-Formed Steel Framing - Lateral Design.
8. AISI S214 - North American Standard for Cold-Formed Steel Framing - Truss Design.
9. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
10. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
11. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
12. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
13. AWCI - Association of Wall and Ceiling Industries.
14. AWS D1.3 - Structural Welding Code - Sheet Steel.
15. SSMA - Steel Stud Manufacturers Association.

1.4 QUALITY ASSURANCE

A. Workmen Qualifications:

1. For the actual erection of cold-formed steel framing system, use only skilled journeymen steel framing erectors who are thoroughly experienced with the materials and methods specified.
2. Use qualified welders and comply with AWS standards.

B. Design Qualifications:

1. Engage a fabricator who uses a qualified Professional Engineer, licensed in the State where the trusses are to be installed, to prepare calculations, shop drawings and other structural data for the cold-formed steel framing system.

C. All cold-formed steel furnished under this section shall be supplied by a manufacturer who is a current member of the Steel Stud Manufacturers Association (SSMA) or Steel Framing Industry Association (SFIA).

D. Steel studs, joists, headers, and other elements used for this project are sized based on SSMA. Elements of equal or greater capacity may be exchanged.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide cold-formed steel framing (CFSF) capable of withstanding design loads indicated on the plans.
2. Design CFSF to withstand design loads meeting the following deflection limits:

a. Exterior walls backing up brick or stone veneer: Horizontal deflection of 1/600 of wall height.
b. Exterior walls clad with metal siding, exterior insulated finish systems or other flexible non-brittle finishes: Horizontal deflection of 1/240 of wall height.
c. Interior Load-Bearing Walls: Horizontal deflection of [1/240][1/360] [1/600][1/720]<Insert> of wall height under [5 psf]<Insert> load.
d. Floor Joist Framing: Vertical deflection of 1/480 for live load and 1/360 for total load of the span.
e. Roof Trusses and Rafters: Vertical deflection of 1/240 of the span.

3. Design CFSF to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120°F.
4. Design system to accommodate construction tolerances, deflection of building structural members (1-inch maximum), and clearances of intended openings.
5. CFSF shall be designed in accordance with all AISI Standards.

1.6 SUBMITTALS

A. Shop Drawings:

1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval, including framing plans indicating size, gauge, weight, and location of all framing members. Shop drawings shall indicate the following:

a. Component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, bracing, bridging, strapping, connections, and accessories or items required of other related work. Provide stud, floor joist, ceiling joist, roof joist, roof rafter, layout.
b. Describe method for securing studs to tracks and for bolted/welded framing connections.
c. Provide calculations for loadings and stresses of the steel framing system, including specially fabricated components and roof trusses, prepared by a registered Professional Structural Engineer, with registration from the State in which the project is located.
d. Detail size and location of all bridging, strapping, bracing, splices, and accessories required for installation.

B. Product Data:

1. Provide product data on standard framing members. Describe materials and finish, product criteria and limitations. Submit manufacturer's installation instructions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Steel members shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of ground and in such a manner so as to eliminate excessive handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing Materials:

1. Studs shall conform to the ASTM designations listed in the General Notes of the drawings, unless noted otherwise, and be formed to channel shape, punched web, with nominal size as indicated on the drawings.
2. Joists shall conform to the ASTM designations listed in the General Notes of the drawings, unless noted otherwise, and be formed of channel or open box shape, solid or punched web with nominal depths as noted on the drawings. All joists shall be single length span (without splices) with a minimum 8-inch bearing on each end, unless otherwise indicated.
3. Trusses shall be constructed of material and connections capable of supporting required loads without exceeding allowable design values.
4. Track shall be minimum 18 gauge (43 mil) thick sheet steel, channel shaped, solid web, same width as studs. Track shall provide a tight fit for studs.

B. Accessories:

1. Bracing, furring, and bridging shall consist of formed sheet steel with thickness determined for conditions encountered. Provide manufacturer's standard shapes, complete with finish same as framing members.
2. Plates, gussets, and clips shall consist of formed sheet steel with thickness determined for conditions encountered. Provide manufacturer's standard shapes, complete with finish same as framing members.

C. Fasteners:

1. Self-drilling, self-tapping screws, bolts, nuts, and washers shall conform to ASTM A90, complete with hot-dip galvanized coating, minimum size: 1/4-14.
2. Expansion anchors shall be "Kwik" bolts, as manufactured by Hilti, Inc.
3. All other fasteners shall be as indicated on drawings or as recommended by the cold-form manufacturer.
4. Welding connections are to be performed in accordance with American Welding Society (AWS) D1.3 "Structural Welding Code - Sheet Steel." Consult AWS D19.0 latest edition "Welding Zinc Coated Sheet" and ANSI Standard Z49.1 for information regarding welding procedures.

D. Finishes:

1. Furnish all studs, joists, and system components with a factory galvanized (G60), finish.

2.2 FABRICATION

A. Fabricate assemblies of framed sections, of sizes and profiles required with framing members fitted, reinforced, and braced to suit design requirements.

B. Fit and assemble in largest practical sections for delivery to Worksite, ready for installation.

C. Bearing studs must be fabricated with full stud end seated against track web. Do not use studs that have been cut at punchouts.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify substrate surfaces and building framing components are ready to receive work.

B. Beginning of installation means acceptance of existing conditions and substrate.

3.2 INSTALLATION

A. General:

1. Cold-formed steel framing system shall consist of structural steel studs and joists with locations as shown on the drawings. All work shall be in accordance with approved shop drawings and manufacturer's latest printed specifications. Framing members shall be securely attached by fusion welding with fillet, plug, butt, or seam type welds or with mechanical fasteners as indicated on the drawings and as recommended by the manufacturer.

   a. All field welding shall be in accordance with AWS previously cited.
   b. Wire tying of stud or joist components will not be allowed.
   c. Complete framing system ready to receive subsequent facing material.

2. Provision shall be made in the studs for rigid fastening of all blocking and special braces or framing and for attachment and support of electrical outlets or other equipment indicated to be supported by stud construction.

   a. All anchorage, bracing and blocking shall be in accordance with approved shop drawings and as recommended by the manufacturer.

3. Surfaces abraded by handling, weld locations and other miscellaneous defects shall be touched-up with zinc-rich galvanizing compound (ZRC) coating.

B. Erection of Studding:

1. Top and bottom track members shall be the same size and gauge as the stud and be continuous for the total length of the framing system or as long as practical and shall be securely attached a maximum of 24 inches on center with approved fastening devices. Studs shall extend in one piece full height vertically between tracks, spaced no greater than 24 inches on center, with all web cut-outs in perfect alignment. Studs shall provide solid backing at corners and jambs. Install studs with all components properly aligned and braced with all work plumb and true, ready and acceptable to receive surface materials.

    a. Coordinate installation of sealant with floor and ceiling tracks.
    b. Field cutting of studs shall be done by sawing.
    c. Splices in axially loaded studs will not be permitted.
    d. Erect load bearing studs, brace and reinforce to develop full strength to meet design requirements.
    e. Extend stud framing through ceiling to underside of floor or roof structure above.
    f. Install intermediate studs above and below openings with studs equally spaced to correspond to adjacent stud spacing.
    g. Provide deflection allowance in stud track, directly below horizontal building framing for non-load bearing framing.
    h. Framing fabricator shall ensure punchout alignment when assembling framing and field cutting to length.
    i. All framing components shall be cut squarely for attachment to perpendicular members.
    j. In the event a track butt joint occurs within a panel, abutting pieces of track shall be butt welded or spliced together. No such splices shall occur at any head or sill condition.

2. Steel studs shall be located not more than 2 inches from all door, abutting partitions, partition corners and other construction. Unless detailed otherwise, track or stud member shall be used as a runner over door frames. Structural studs and joists shall be securely and rigidly anchored in place to give total and complete support to subsequent materials attached thereto. All studs shall be securely attached to jamb and head anchor clips of each door frame by manufacturer's recommended method.

    a. Construct corners using minimum three studs. Jamb studs at doors, windows, and other wall openings shall be designed to resist the tributary load of the opening and meet specified performance requirements.
    b. Cold-rolled steel channel stiffeners or bridging shall be provided and installed horizontally every 60 inches in all framing systems through stud web cut-outs with clips welded in place at each stud.

C. Erection of Joists:

1. Place joist at spacing indicated on drawings.
2. Make provisions for erection stresses. Provide temporary alignment and bracing.
3. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
4. Provide web stiffeners at reaction points.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and erection of all metal items shown on the drawings and not specified under other sections. These include, but are not necessarily limited to the following:

1. Rough hardware, loose bearing plates, miscellaneous framing, bracing and supports.
2. Handrails, guardrails, and brackets.
3. Lintels, angles, clips, and plates.
4. Edge angles.
5. Miscellaneous bracing and brackets.
6. Pipe bollards.
7. Copings and gravel stops.
8. Steel framed stairs.
9. Elevator pit sump and trench drain gratings.
10. Ladders.
11. Structural support for ceiling hung toilet partitions.
12. Bolts, rods, dowels, nuts, washers, anchors, brackets and other miscellaneous iron.

B. Structural notes indicated on the drawings regarding any metal fabrication shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 05 12 23 - Structural Steel.

C. Section 05 51 00 - Metal Stairs.

D. Architectural metals and materials in Divisions 07, 08, 09 and 10.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provisions shall govern.

1. AISC 303 - Code of Standard Practice for Buildings and Bridges.
2. AISC 341-16 - Seismic Provisions for Structural Steel Buildings, including any Supplements.
3. AISC 360-16 - Specification for Structural Steel Buildings.

4. ASTM A36 - Standard Specification for Carbon Structural Steel.
5. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
6. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
7. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
8. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
9. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
10. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
13. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
14. AWS D1.1 - Structural Welding Code - Steel.
15. AWS D1.3 - Structural Welding Code - Sheet Steel.
16. AWS D1.8 -- Structural Welding Code - Seismic Supplement.
17. California Building Standards Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2 (including all supplements).

1.4 QUALITY ASSURANCE

A. Fabrication, Erection and Welding Qualifications:

1. Fabricate steel members in accordance with AISC Specifications for the design, fabrication, and erection of structural steel for buildings.
2. All welding of structural steel shall be performed by operators who have been recently qualified as prescribed in "Qualification Procedures" of the American Welding Society (AWS).

B. Project Conditions: Do not fabricate components that require fitting to structural elements or into finished spaces until dimensions are verified at the jobsite.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Handrail and Guardrail Systems:

a. Concentrated force of 200 lb applied at any point in any direction.
b. Uniform force of 50 lb per linear foot applied in any direction.
c. Concentrated and uniform forces above need not be assumed to act concurrently.

2. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated force of 50 lb applied to one square foot at any point in the system including panels, intermediate rail balusters, or other elements composing the infill area.

a. Above force need not be assumed to act concurrently with uniform horizontal forces on handrails or guardrails of railing systems in determining stress on guard.

3. Treads of Steel Stairs: Capable of withstanding a uniform force of 100 lb per square foot or a concentrated force of 300 lb on an area of 4 square inches located in the center of the tread, whichever produces the greater stress.
4. Platforms of Steel Stairs: Capable of withstanding a uniform force of 100 lb per square foot.
5. Heavy Duty Metal Bar Gratings: Capable of withstanding a uniform force of 250 lb per square foot or a concentrated force of 8,000 lb, whichever produces the greater stress.
6. In general, for other types of conditions, limit deflection to 1/360 of span or 1/2 inch, whichever is less.

a. Use concealed fasteners for semi-exposed work. Clearly indicate type and location of fasteners on submittal data.
b. Connections: Bolt or weld at Contractor's option depending on substrates and field conditions involved.

1.6 SUBMITTALS

A. Prepare and submit shop drawings detailing the fabrication and erection of each metal fabrication indicated on architectural and structural drawings. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. Where installed metal fabrications are indicated to comply with certain design loadings, include structural calculations, material properties, and other information needed for structural analysis that has been prepared and certified by a Professional engineer licensed in the State where the project is located.
2. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. Product data, and installation instructions where applicable, for products used in miscellaneous metal fabrications, including paint products and grout.

C. Provide samples of materials and finished products requested by the Engineer.

D. Welder's Certificates: Submit certification for all welders employed on the project demonstrating they have been AWS qualified to perform the welding procedures required for this project.

1.7 DELIVERY, STORAGE AND HANDLING

A. Steel fabrications shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of ground and in such a manner so as to eliminate excessive handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All material shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles are required, they shall be of the same manufacturer.
2. All metal surfaces shall be free from any defects which would impair the strength, durability, appearance, and shall be of the best commercial quality, for the purposes intended and adequate to withstand the strains and stresses to which they will be subject.

B. Miscellaneous Steel Shapes:

1. All miscellaneous metal, including structural steel shapes, miscellaneous plates, bars, and angles, shall conform to ASTM A36 unless noted.

    a. Square and rectangular steel tubing shall be hot formed conforming to ASTM A500, Grade B (minimum yield stress 46 ksi).
    b. Cold-rolled steel sheet shall conform to ASTM A1008.
    c. Steel pipe shall conform to ASTM A53, Grade B (minimum yield stress 35 ksi).
    d. Cast iron shall conform to ASTM A48, Class 30, minimum 30,000 psi tensile strength (gray) or ASTM A47 (malleable).

2. Galvanized Carbon Steel Sheets: ASTM A525, G90 zinc coating.
3. Cold-Finished Steel Bars: ASTM A108, grade as selected by fabricator.
4. Aluminum Castings: 214 aluminum alloy.
5. Aluminum Extrusions: 6053 aluminum alloy temper to suit.
6. Stainless Steel: 18-8 alloy, type 302, No. 4 finish unless otherwise specified.

C. Miscellaneous Related Materials:

1. Welding Electrodes: Conform to AISC and AWS D1.1.
2. Steel Primer Paint: Rust inhibitive primer exceeding the performance requirements of FS-TT-P-86d, Types I and II.
3. Hot-Dip Galvanizing: ASTM A123 or as applicable after fabrication.
4. Galvanizing Repair Paint: High zinc-dust content paint for re-galvanizing burned or abraded area on galvanized surfaces.
5. Non-Shrink Grout: Non-shrink grout, conforming to ASTM C1107, shall be pre-mixed, non-metallic, non-corrosive, non-staining product of 7,000 psi minimum compressive strength at 28-days.
6. Dry Pack: A cement-sand mix of 1 part Portland cement to 2-1/2 parts sand by volume with necessary water added to provide for solid compaction.
7. Gasket Material: Soft compressible neoprene rubber strip, thickness and width as required.
8. Filler Material for Welding Aluminum: Type 53.
9. Miscellaneous: All items of miscellaneous metal, including clip angles, ties, straps, anchors, bolts, angles, rods, and other appurtenances required for proper installations.

D. Anchoring Devices:

1. Bolts shall conform to ASTM A307, Grade A, complete with suitable nuts and washers.
2. High strength bolts, if required, shall conform to ASTM F3125, Grade A325 (minimum diameter 3/4 inch).
3. Expansion anchors, unless otherwise indicated, shall be zinc coated high tensile strength steel wedge type "Kwik bolts - Standard" as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma.
4. Fasteners shall be of same material and finish of work to be fastened together.

2.2 FABRICATION AND MANUFACTURE

A. All miscellaneous metal items herein specified shall be shop fabricated to the required shapes and dimensions indicated on the drawings and approved shop drawings.

B. Fabricate work in shop to the largest assemblies practicable.

C. It shall be the Contractor's responsibility to verify all field conditions and dimensions prior to fabrication.

D. All work shall be fabricated with straight lines, sharp angles, smooth curves as detailed and shall meet the minimum requirements of the previously cited AISC publications.

E. Do not incorporate damaged or distorted materials into the work.

F. Finished members shall be free from kinks, twists, burrs, and open joints.

G. All joints shall be accurately made and tightly fitted with adequate fastenings. Joints exposed to weather shall be formed to exclude water.

H. Fastening shall be concealed where practical. Permanent shop fabricated fastenings or connections shall be welded. Do not use screws or bolts where they can be avoided.

I. All welding shall be done by certified, experienced operators.

J. Surfaces to be welded shall be well cleaned of paint and other foreign matter.

K. Galvanizing: Hot dip galvanized items shown on the drawings or specified to be galvanized after fabrication. Galvanize metal exposed to the exterior and all shelf angles.

1. ASTM A153 for galvanizing of iron and steel hardware.
2. ASTM A123 for galvanizing of rolled, pressed and forged steel shapes, plates, bars, and strips 1/8 inch thick and heavier.
3. ASTM A386 for galvanizing of assembled steel products.
4. Fill vent holes and grind smooth after galvanizing.

L. Shop Painting: Shop paint miscellaneous metal work, except those members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, galvanized surfaces, and surfaces to receive a spray applied fireproofing.

1. Remove scale, rust, and other deleterious materials before the shop coat of paint is applied. Clean off heavy rust and loose mill scale in accordance with SSPC SP 2 "Hand Tool Cleaning". Remove oil, grease and similar contaminants in accordance with SSPC SP 1 "Solvent Cleaning".
2. Applyone shop coat of metal primer paint to fabricated metal items.
3. Brush or spray on metal primer paint, at a rate to produce a uniform dry film thickness of 2.0 mils for each coat. Provide full coverage of joints, corners, edges, and all exposed surfaces.

2.3 LINTELS

A. Steel lintels shall be provided for all openings and recesses throughout the building, except where other types are indicated. Lintels, unless otherwise indicated, shall consist of steel angles (minimum 3-1/2 x 3-1/2 inches x 5/16 inch), provide one (1) for each 4 inches of wall thickness.

1. Lintels, unless otherwise indicated, shall have a minimum bearing of 8 inches at each end.

2.4 STEEL STAIRS

A. Steel stairs shall be fabricated complete with railings, toe guards, stringers, curbs, landings, treads, risers, framing fasteners, and all other required appurtenances.

1. Steel pan stairs (concrete filled treads) shall have treads, risers and landings formed of minimum 14 gauge steel with front edge of tread turned up to form a square nosing and a tread pan depth of 1-1/2 inch with intermediate landings having a pan depth of 3 inches. Each tread and landing pan shall have metal rib lath or wire reinforcement welded to pan bottom. Underside of treads and landings shall be braced or reinforced as necessary to meet the minimum design requirements.
2. Prefabricated grating treads and landings shall extend full width of stair in single sections with supports securely bolted to stringers or carriages in a rigid and substantial manner. Landing tread shall be flush and level with adjacent grating.

B. Steel stairs shall be of structural steel members as indicated on the drawings with stringers extending the perimeter of landings, connecting with all sections and allowing a 4-inch-high curb. All open ends of curbs and stringers shall be welded closed. Treads, including landing, shall be equally spaced for the total run and rise of stairs. Fabrication of stair(s) shall be in such a manner as to incorporate a design criterion that will allow treads to sustain forces as outlined in Design Requirements.

2.5 RAILINGS

A. Installed railings shall be capable of withstanding forces as outlined in Design Requirements.

2.6 VERTICAL ACCESS LADDERS

A. Vertical access ladders, including safety cages, shall be fabricated of mild steel with all bar stock having rolled or eased edges. Ladder stringers, unless otherwise indicated shall be minimum 2-1/2 inches x 3/8-inch-thick bar stock and shall be spaced 16 inches apart with rungs (minimum 3/4-inch diameter solid steel) spaced 12 inches on center which shall be welded securely to stringers. Extend stringers 3'-6" above floor or roof to height indicated with top loops stiffened for rigidity. For through ladder extensions, the rungs shall stop at the floor or parapet elevation. For side-step ladders, the rungs shall be carried to the next regular spaced rung at or above the 3'-6" minimum height of the stringer. Anchor bracket shall be fabricated of bar stock of same size as stringers and of such length to position center of rungs 7 inches from face of wall or structure. Brackets shall be spaced not to exceed 72 inches on center.

B. Safety cages shall be fabricated as required by OSHA code and/or where indicated on the drawings. Top of cage shall be open to platform or roof and connected to the railing, platform, building, or structure in a rigid and secure manner and in order to afford the maximum of protection.

2.7 ROOF EQUIPMENT PLATFORMS

A. Roof equipment platforms shall be fabricated of structural steel members as indicated on the drawings with center supports or cross beam members to be located and secured on worksite to accommodate mechanical equipment.

2.8 ROOF CURB FRAMING

A. All roof openings requiring curbs shall be furnished and installed as shown. Provide holes and bolts for attachment of wood. Contractor shall verify all opening sizes and locations with mechanical and other trades.

2.9 GRATED TRENCH COVERS

A. Provide steel grated trench covers where indicated on the drawings. Bearing bars shall extend in the direction of the span with ends of grating sections occurring directly over supports. Anchoring of grating shall be in a secure and substantial manner as indicated on approved shop drawings. Installed grating shall be at the elevations shown, free from warp or camber and present a level and even surface. Notching of bearing bars at supports to maintain elevations will not be permitted.

1. Provide full perimeter banding for each section of floor grate. Bands shall equal the depth of the grating.

2.10 ANGLE FRAMING

A. Furnish and install angles for fastening metal panels, roof edge flashing curb opening members, and similar items, complete with anchor bolts and nuts as indicated on the drawings.

2.11 TRENCH FRAMES

A. Furnish and install trench frames as shown on the drawings consisting of steel angles, sized to accommodate grating. Frames shall be of welded construction complete with anchors for embedment into concrete.

B. Where indicated on the drawings, modify existing trench frames to size indicated. Such work may require field welding and cutting. Provide new grates.

2.12 DOCK LEVELER FRAMES

A. Furnish and install dock leveler frames as shown on the drawings consisting of steel angles, sized to accommodate leveler. Frames shall be of welded construction, complete with anchors for embedment into concrete.

2.13 TOE PLATES, GUARD ANGLES AND TOE ANGLES

A. Furnish and install toe plates, guard angles and toe angles where indicated on the drawings, complete with proper anchoring devices.

2.14 PIPE GUARDS (BOLLARDS)

A. Furnish and install all pipe protectors; each side of overhead doors, sliding doors, coiling doors, and columns as indicated on the drawings. Posts shall be extra strong/heavy duty, 6 inches in diameter galvanized steel (primed) pipe embedded into concrete at least 42 inches above ground. Fill posts with concrete and shape top slightly concave.

2.15 GUARD RAILS

A. Furnish and install guard rails where and as indicated on the drawings. Posts shall be heavy duty 4 inches in diameter galvanized (primed) steel pipe with cap. Embed posts into concrete a minimum of 36 inches. Posts anchored direct to floor or slabs shall be complete with base plate and with proper anchoring devices. Guard rails shall be properly installed with all bolts drawn tight full to head.

2.16 ANCHOR BOLTS

A. Furnish and install all anchor bolts required, including those for roof edge members, pump and motor bases, and similar areas. Anchor bolts shall be set in accordance with details and tolerances required.

2.17 STRUCTURAL SUPPORTS FOR CEILING HUNG TOILET PARTITIONS

A. Furnish and install supports constructed of standard steel angles, channels, or otherwise indicated. Securely anchor to the structure above.

PART 3 - EXECUTION

3.1 ERECTION

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until such detrimental conditions are corrected.

B. All metal fabrications work shall be erected as indicated on the drawings, as confirmed by field measurements and in accordance with approved shop drawings. Furnish erection bolts, wedges, temporary bracing, and all other required appurtenances for a complete installation. Work shall be set accurately in place and permanently fastened in a neat manner. The work shall be plumb, level, or to the slopes indicated. Contractor shall do all cutting, fitting and similar work required to properly assemble and install the Contractors work. Contractor shall furnish all sleeves, bolts, screws and anchors, expansion shields, and similar anchoring devices, for assembling and securing the work and shall do all drilling, tapping, cutting and all other required operations necessary for a complete installation.

1. Installation of shelf and relieving angles when attached to the structural frame shall be left loose until masonry coursing has been established, then members shall be rigidly and securely anchored in place.

C. All field welding shall be in accordance with AWS as previously cited.

D. Field splicing of fabricated items is not allowed, unless said items exceed standard shipping length or change of direction requires splicing. Mechanical splicing by means of wedges without full welding shall not be allowed.

E. All installed metal work shall be Engineer approved before being covered by subsequent materials.

F. Each fabricated item shall be complete with attachment devices as shown or required to completely install each item in a secure manner.

3.2 FIELD TOUCH UP

A. Immediately after erection and before subsequent materials placed, Contractor shall touch up all erection bolts, all field welds and all scratched or abraded areas in shop coat. All touch up areas shall be first cleaned and then painted using a matching rust-inhibitive paint in color and formulation to match shop coat.

END OF SECTION

SECTION 05 0503

SHOP-APPLIED METAL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of factory or shop-applied priming applied to steel supplied to Project without finish coat.
   2. Quality of and procedures for field touch-up and repair of factory-applied priming and galvanizing.

B. Related Requirements:
   1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing' for repair to galvanized coatings.
   2. Sections under 09 9000 heading: Finish painting.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A780/A780M-09(2015), ‘Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings'.
      b. ASTM B695-04(2016), 'Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Product data and samples, if requested by Architect.

PART 2 - PRODUCTS

2.1 FINISHES

A. Factory And Shop-Applied Primer:
   1. Compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.
   2. Primer on unexposed, unfinished surfaces may be fabricator's standard shop coat.

B. Repairs To Primed Surface:

C. Unless otherwise specified, use primer which matches characteristics of original primer and is compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.

D. Material For Repairs Of Galvanized Surfaces:
   1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
      a. Zinc-Rich Paints:
         1) Zinc-Dust Content: Dried film shall contain 94 percent minimum of zinc-dust by weight.
         2) Acceptable Manufacturers:
            a) Galvax by Alvin Products Inc, Everett, MA www.alvinproducts.com.
            b) ZRC Galvilite by ZRC Worldwide, Marshfield, MA www.zrcworldwide.com.

c) Equal as approved by Architect before bidding. See Section 01 6200.

2. Structural, Load-Bearing Items And Items Exposed To Weather:
   a. Zinc-Based Solders, Powder, Or Rod:
      1) Zinc-Cadmium solder with liquidus temperature range from 518 to 527 deg F (270 to 275 deg C), or
      2) Zinc-Tin-Lead alloy with liquidus temperature range from 446 to 500 deg F (230 to 260 deg C).
   b. Sprayed Zinc: Wire, ribbon, or powdered zinc suitable for process.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation:
   1. General:
      a. Clean, grind, or otherwise prepare welds in steel that is to be coated within limits acceptable to welder responsible for structural integrity.
      b. Surfaces to be coated shall be clean, dry and free of oil, grease, and corrosion products.
   2. Preparation Of Primed, Ungalvanized Surfaces:
      a. Clean welds and grind serious abrasions.
   3. Preparation Of Galvanized Surfaces:
      a. Follow requirements of ASTM A780/A780M and following:
      b. For Repair Using Zinc-Rich Paints:
         1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP10 (1 to 2 mil anchor pattern), as minimum.
         2) Where circumstances do not allow blast cleaning, power disk sand to bright metal finish.
         3) Extend surface preparation into undamaged galvanized area.
         4) Remove flux residue and weld spatter from welded areas.
      c. For Repair Using Zinc-Based Alloys:
         1) Clean surface to be reconditioned using wire brush, light grinding action, or mild blasting.
         2) Extend surface preparation into surrounding, undamaged galvanized areas.
         3) Remove flux residue and weld spatter from welded areas.
         4) Preheat cleaned area to at least 600 deg F (316 deg C).
            a) Do not overheat surface beyond 750 deg F (400 deg C) or allow surrounding galvanized coatings to be burned.
            b) Wire brush surface during preheating.
      d. For Repair Using Sprayed Zinc (Metallizing):
         1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP5 as minimum.
         2) Extend surface preparation into undamaged galvanized area.
         3) Remove flux residue and weld spatter from welded areas.

3.2 REPAIR / RESTORATION

A. Repairs To Primed, Ungalvanized Surfaces:
   1. Thoroughly clean metal and give one (1) prime coat of specified material, well-worked into metal joints and open spaces. Match existing primed finish as required.
      a. Do not apply primer at temperatures below 45 deg F (7 deg C).
      b. Protect un-primed machine-finished surfaces against corrosion by priming.

B. Repairs To Galvanized Surfaces:
   1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
      a. Repair Using Zinc-Rich Paints: Spray- or brush-apply zinc-rich paint to prepared area. Apply paint in single application employing multiple spray passes to achieve dry film thickness of 2 mils.

2. Structural, Load-Bearing Items And Items Exposed To Weather:
   a. Repair Using Zinc-Based Alloys:
      1) Rub cleaned, pre-heated areas with repair stick to deposit evenly distributed layer of zinc alloy. If powdered zinc alloys are used, sprinkle powder on surface and spread out with spatula or similar tool.
      2) Remove flux residue by rinsing with water or wiping with damp cloth.
   b. Repair Using Sprayed Zinc (Metallizing): Apply 2 mil minimum coating by means of metal-spraying pistols fed with either zinc wire or zinc powder in accordance with requirements of ASTM B695, Type I.
3. All Items:
   a. Apply repair materials immediately after surface preparation is complete.
   b. Take thickness measurements, with either magnetic or electromagnetic gauge, to ensure applied coating is as specified or agreed to.

END OF SECTION

SECTION 05 0523

METAL FASTENING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of structural metal-to-metal, wood-to-metal, and wood-to-wood bolts used on Project.
   2. Requirements and standards for site welded metal-to-metal connections.

B. Related Requirements:
   1. Section 03 1511: 'Concrete Anchors And Inserts' for cast-in-place and drilled-in anchor bolts.
   2. Furnishing and installing of structural bolts specified under Section concerned.
   3. Performance of welding specified under Section concerned.

1.2 REFERENCES

A. Reference Standards:
   1. American National Standards Institute / American Welding Society:
      a. ANSI/AWS D1.1/D1.1M:2015, ‘Structural Welding Code - Steel’.
      b. ANSI/AWS D1.3/D1.3M:2018, ‘Structural Welding Code - Sheet Steel’.
   2. ASTM International:
      a. ASTM A307-14, ‘Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength'.

1.3 QUALITY ASSURANCE

A. Qualifications: Requirements of Section 01 4301 applies, but not limited to the following:
   1. Welders shall be certified 30 days minimum before beginning work on Project. If there is doubt as to proficiency of welder, Architect may require welder to take another test, at no expense to Owner. Certification shall be by Pittsburgh Laboratories or other authority approved by Architect.

B. Certifications:
   1. Maintain welder's certifications on job-site.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Materials:
   1. Bolts And Threaded Fasteners:
      a. Bolts: Conform to requirements of ASTM A307, Grade A.

2.2 ACCESSORIES

A. Arc-Welding Electrodes: Type E70XX AWS Iron and Steel Arc-welding electrodes and meeting current AISC Specifications.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Welding shall meet requirements of ANSI / AWS D1.1 and D1.3.

B. Minimum weld sizes, unless detailed otherwise.
   1. Weld pipe columns to base plates and top plates with 1/4 inch (6 mm) fillet weld all around.
   2. Weld glu-lam connection side plates to base plates with 1/4 inch (6 mm) fillet weld all along outside edges.
   3. Weld stiffeners to pipe columns with 1/4 inch (6 mm) fillet weld all around.

END OF SECTION

SECTION 05 5133

VERTICAL METAL LADDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Metal Interior Ladders.

B. Related Requirements:
   1. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
   2. Section 05 0523: ‘Metal Fastening’ for quality of welding.
   3. Section 06 2001: ‘Common Finish Carpentry Requirements’ for installation.
   4. Section 09 9124: ‘Interior Painted Metal’ for painting of interior ladders.

1.2 REFERENCES

A. Reference Standards:
   1. American National Standards Institute/American Ladder Institute:
      a. ANSI/ALI A14.3-2018, ‘American National Standard for Ladders - Fixed - Safety Requirements'.
   2. ASTM International:
      a. ASTM A36/A36M-14, ‘Standard Specification for Carbon Structural Steel'.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Materials:
   1. Steel For Interior Ladders: Meet requirements of ASTM A36/A36M.
   2. Stringers: 3/8 by 2-1/2 inch (9.5 by 63 mm) flat bar stock.
   3. Treads: One inch (25 mm) round rungs.
   4. Mounting Brackets: Drilled angles.

B. Fabrication:
   1. Fabricate ladders to comply with requirements of ANSI/ALI A14.3 including but not limited to :
      a. Minimum requirements for design, construction, and use of fixed ladders.
      b. Requirements for cages, wells, and ladder safety systems used with fixed ladders, in order to minimize personal injuries.
      c. All parts and appurtenances necessary for safe and efficient ladder shall be considered integral parts of design.
   2. Weld joints. Grind joints to be smooth to the touch and finished to match adjoining surfaces.
   3. Space treads 12 inches (300 mm) on centers.
   4. Fabricate mounting brackets of drilled angles.
   5. Prime interior ladders.

2.2 ASSESSORIES

A. Safety Post:
   1. Description:

a. Enables user to step on or off fixed ladder below in safe standing position while holding onto post.
b. Telescoping, steel, spring balanced, painted finish.
c. Extends to 42 inches (1 067 mm) to locked position.

2. Design Criteria:
   a. Meets ANSI A14.3 and OSHA 1910.27 requirements 200 pound load.
3. Acceptable Products:
   a. Model SLP by Maxam Metal Products Limited, Burnaby, BC www.maxammetal.com.
   b. Equal as approved by Architect before bid. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Support ladder with welded steel brackets located at top and bottom, and equally spaced but no more than 60 inches (15 000 mm) on center between top and bottom where ladder is installed against a wall. Size brackets to support design loads specified in ANSI/ALI A14.3.

B. Safety Post:
   1. Mount safety post to top two rungs of fixed vertical ladder.

END OF SECTION

SECTION 05 5871

METAL BRACKETS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Supplied But Not Installed Under This Section:
   1. Metal Brackets:
      a. Metal brackets necessary to support Vanities in Rest Rooms.
      b. Metal brackets necessary to support Counter.

B. Related Requirements:
   1. Metal Brackets:
      a. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
      b. Section 05 0523: 'Metal Fastening' for quality of welding.
      c. Section 06 2001: ‘Common Finish Carpentry Requirements’ for installation of metal brackets.
      d. Section 09 9124: ‘Interior Painted Metal’ for finish painting.

1.2 REFERENCES

A. Reference Standards (Metal Brackets):
   1. ASTM International:
      a. ASTM A36/A36M-14, ‘Standard Specification for Carbon Structural Steel'.

PART 2 - PRODUCTS

2.1 FABRICATED UNITS

A. Materials:
   1. Metal Brackets:
      a. Steel: Meet requirements of ASTM A36/A36M.
      b. Fabrication:
         1) Fabricate as detailed.
         2) Grind exposed welds smooth and polish to match non-welded metal finish.
         3) After fabrication and drilling of mounting holes, shop prime.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 0573

PRESERVATIVE WOOD TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of wood preservative treatment where specified.

B. Related Requirements:
   1. Section 06 1100:
      a. Characteristics of wood to be pressure-treated.
      b. Furnishing and installing of pressure-treated wood.

1.2 REFERENCES

A. Definitions:
   1. Preservative-Treated Wood: Wood exposed to high levels of moisture or heat susceptible to decay by fungus and other organisms, and to insect attack. The damage caused by decay or insects can jeopardize the performance of the wood members so as to reduce the performance below that required. Preservative treatment requires pressure-treatment process to achieve depth of penetration of preservative into wood to verify that the wood will be resistant to decay and insects over time.
   2. Treated Wood: Wood impregnated under pressure with compounds that reduce its susceptibility to flame spread or to deterioration caused by fungi, insects, or marine bores.

B. Reference Standards:
   1. American Wood Protection Association:
      a. AWPA P5-10. 'Standard For Waterborne Preservatives'.
      b. AWPA P22-10. 'Standard For Ammoniacal Copper Zinc Arsenate (ACZA)'.
      c. AWPA P51-10, ‘Standard for Zinc Borate (ZB)’.
      d. AWPA T1-12, ‘Use Category System: Processing and Treatment Standard For Treated Wood’.
      e. AWPA U1-12, ‘Use Category System: User Specification For Treated Wood’.
   2. International Building Code (IBC) (2018 or most recent edition adopted by AHJ):
      a. Chapter 23, 'Wood':
         1) Section 2300, 'Minimum Standards and Quality':
            a) 2303.1, ‘General’:
               (1) 2303.1.8, 'Preservative-Treated Wood’.
         2) Section 2400, 'General Construction Requirements':
            a) 2304.11, ‘Protection Against Decay and Termites’:
               (1) 2311.2, 'Wood Used Above Ground’.
               (2) 2311.4, 'Wood In Contact With The Ground'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Certificate: Certificate of pressure treatment showing compliance with specification requirements and including information required under IBC Section 2303.1.8.1, ‘Identification’.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
   1. Acceptable Manufacturers:
      a. Arch Wood Protection Inc, Atlanta, GA www.wolmanizedwood.com.
      b. Hoover Treated Wood Products, Thomson, GA www.frtw.com.
      c. Osmose Inc, Griffin, GA www.osmose.com.
      d. U S Borax Inc, Valencia, CA www.borax.com/wood.
      e. Viance LLC, Charlotte, NC www.treatedwood.com.
      f. Equal as approved by Architect before bidding. See Section 01 6200.

B. Performance:
   1. Framing lumber grade and species shall be as specified in Section 06 1100 for particular use.
   2. Interior Wood In Contact With Concrete or Masonry:
      a. Preservatives:
         1) Disodium octoborate tetrahydrate (DOT / SBX) meeting requirements of AWPA U1 and with retention of 0.25 lbs per cu ft (4 kg per cu meter).
         2) Zinc borate meeting requirements of AWPA U1 and with retention of 0.17 lbs per cu ft (2.7 kg per cu meter).
         3) CCA-C (47.5 percent chromium trioxide, 18.5 percent copper oxide and 34 percent arsenic pentoxide) by Koppers Performance Chemicals, Griffin, Georgia, http://www.koppersperformancechemicals.com/ (0.25 lb/cu ft minimum retention).
         4) DURA-GUARD by Hoover Treated Wood Products, Thomson, GA www.frtw.com (.40 lb/cu ft minimum retention).
      b. Lumber: Treat in accordance with AWPA U1.
   3. Exterior Wood Continuously Exposed To Weather:
      a. Preservatives: Waterborne preservatives meeting requirements of AWPA U1 with retention levels as required by AWPA U1 for specific application.
      b. Lumber: Treat in accordance with AWPA U1.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 1011

WOOD FASTENINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of wood fastening methods and materials used for Rough Carpentry unless specified otherwise.

B. Related Requirements:
   1. Section 03 1511: 'Concrete Anchors and Inserts' for Quality of Anchors and Inserts.
   2. Section 05 0523: 'Metal Fastenings' for Quality of bolts used for Rough Carpentry.
   3. Furnishing and installing of other fasteners are specified in individual Sections where installed.

1.2 REFERENCES

A. Reference Standards;
   1. ASTM International:
      a. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
      b. ASTM D3498-18, 'Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems'.
      c. ASTM F1667-18a, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's literature on framing anchors and powder actuated fasteners.
   2. Shop Drawings:
      a. Submit diameter and lengths of fasteners proposed for use on Project. If length or diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
         1) Adjusted fastener spacing where using proposed fasteners and,
         2) Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.
      b. Submit on powder-actuated fasteners other than those specified in Contract Documents showing design criteria equivalents at each application.
      c. Show type, quantity, and installation location of framing anchors. Where necessary, reference Drawing details, etc, for installation locations.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Description:
   1. Nail Terminology:
      a. When following nail terms are used in relation to this Project, following lengths and diameters will be understood. Refer to nails of other dimensions by actual length and diameter, not by one of listed terms:

Nail Term	Length	Diameter	Length	Diameter

8d Box	2-1/2 inches	0.113 inch	63.5 mm	2.827 mm
8d Common	2-1/2 inches	0.131 inch	63.5 mm	3.389 mm
10d Box	3 inches	0.128 inch	76.2 mm	3.251 mm
10d Common	3 inches	0.148 inch	76.2 mm	3.759 mm
16d Box	3-1/2 inches	0.135 inch	88.9 mm	3.411 mm
16d Sinker	3-1/4 inches	0.148 inch	82.6 mm	3.759 mm
16d Common	3-1/2 inches	0.162 inch	88.9 mm	4.115 mm

B. Materials:
   1. Fasteners:
      a. General:
         1) Fasteners for preservative treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronzed, or copper. Coating weights for zinc-coated fasteners shall be in accordance with ASTM A153/A153M.
      b. Nails:
         1) Meet requirements of ASTM F1667.
         2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
      c. Wood Screws:
         1) SDS Screws:
            a) Approved Products. See Section 01 6200 for definitions of categories.
               (1) SDS Screws by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
         2) All Other: Standard type and make for job requirements.
      d. Powder-Actuated Fasteners:
         1) Quality Standard: Hilti X-DNI 62P8.
         2) Manufacturers:
            a) Hilti, Tulsa, OK www.us.hilti.com.
            b) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
            c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.
   2. Adhesives:
      a. Construction Mastics:
         1) Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
         2) Use phenol-resorcinol type for use on pressure treated wood products.
   3. Framing Anchors:
      a. Framing anchors and associated fasteners in contact with preservative hot dipped zinc-coated galvanized steel or stainless steel. Do not use stainless steel items with galvanized items.
      b. Acceptable Products:
         1) KC Metals Inc, San Jose, CA www.kcmetals.com.
         2) Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
         3) United Steel Products Co Inc (USP), Montgomery, MN www.uspconnectors.com.
         4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 ERECTION

A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.

B. Provide washers with bolt heads and with nuts bearing on wood.

END OF SECTION

SECTION 06 1100

WOOD FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install wood framing and blocking as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Miscellaneous structural steel elements.
   2. Roof related blocking, wood nailers, and curbs.
   3. Wood panel product sheathing.
   4. Trusses.

C. Related Requirements:
   1. Section 05 1223: 'Structural Steel' for furnishing of miscellaneous structural steel.
   2. Section 06 0573: 'Preservative Wood Treatment' for quality of preservative wood treatment.
   3. Section 06 1636: 'Wood Panel Product Sheathing'
   4. Sections in Division 07: Roofing membranes for related blocking, wood nailers, and curbs.
   5. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts':

1.2 REFERENCES

A. Association Publications:
   1. American Lumber Standard Committee (ALSC) (Maintains NIST standard):
      a. Voluntary Product Standard:
         1) PS 20-15, 'American Softwood Lumber Standard'.
   2. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
      a. Voluntary Product Standard DOC PS 20-15, 'American Softwood Lumber Standard'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.
   2. Manufacturer Instructions:
      a. Copies of pamphlets specified in REFERENCE Article. After Architect's examination, keep pamphlets on Project site with approved shop drawings. Pamphlets may be obtained from Truss Plate Institute, Wood Truss Council of America, or from Truss Fabricator.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Protect lumber and sheathing and keep under cover in transit and at job site.
   2. Do not deliver material unduly long before it is required.

B. Storage And Handling Requirements:
   1. Store lumber and sheathing on level racks and keep free of ground to avoid warping.
   2. Stack to insure proper ventilation and drainage.
   3. Handle and store wood trusses in accordance with ANSI / WTCA Booklet BSCI except trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and no part of any truss is required to drop more than 18 inches (450 mm).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Dimension Lumber:
   1. Design Criteria:
      a. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
      b. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
      c. Lumber 2 inches (50 mm) or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15'.
      d. Preservative Treated Plates / Sills:
         1) 2x4 (38 mm by 64 mm): Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E)
         2) 2x6 (38 mm by 140 mm) And Wider: No. 2 or or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID www.ilevel.com. (LSL 1.3 E).

B. Posts, Beams, And Timbers 5 Inches by 5 Inches (125 mm by 125 mm) And Larger:
   1. Design Criteria:
      a. No. 1 or better Douglas Fir or Southern Pine.

C. Lumber Ledgers:
   1. Design Criteria:
      a. No. 2 Douglas Fir-Larch, or Southern Pine.

D. See Contract Drawings for additional requirements.

2.2 ACCESSORIES

A. Blocking:
   1. Sound lumber without splits, warps, wane, loose knots, or knots larger than 1/2 inch (13 mm).

B. Furring Strips:
   1. Utility or better.

C. Sill Sealer:
   1. Closed-cell polyethylene foam, 1/4 inch (6 mm) thick by width of plate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill, and ledger plates, door and window subframes and bucks, etc.

B. Interface With Other Work:
   1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
   2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Contract Drawings.

C. Tolerances:
   1. Walls:
      a. 1/4 inch (6 mm) in 20 feet (6 meters), non-cumulative in length of wall.
      b. 1/8 inch (3 mm) in 10 feet (3 meters) with 1/4 inch (6 mm) maximum in height of wall.
      c. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.

D. Floors:
   1. Place with crown side up.
   2. Provide accurately fitted header and trimmer joists of same size as regular joists around floor openings, unless detailed otherwise, and support by steel joist hangers.
   3. Double joists under partitions that parallel run of joists.

E. Walls:
   1. Openings: Single, bearing stud supporting header and one adjacent (king) stud continuous between top and bottom plates, unless shown otherwise.
   2. Corners And Partition Intersections: Triple studs.
   3. Top Plates In Bearing Partitions: Doubled or tripled and lapped. Stagger joints at least 48 inches (1 200 mm).
   4. Firestops:
      a. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over 10 feet (3 000 mm) in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.
      b. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of 20 feet (6 000 mm), length or height.
   5. Sill Plates:
      a. Shear Walls And Bearing Walls:
         1) Provide specified anchor 12 inches (300 mm) maximum and 4 inches (100 mm) minimum from each end of each plate.
         2) Shear Walls: Fasten with anchor bolts embedded in concrete or with screw anchors.
         3) Bearing Walls: Fasten with anchor bolts embedded in concrete, or with screw anchors or expansion bolts in drilled holes.
      b. Non-Structural Walls: Fasten with powder actuated fasteners.
      c. In addition to requirements of paragraphs 'a' and 'b' above, set sill plates of interior walls measuring less than 36 inches (900 mm) in length in solid bed of specified construction adhesive, except where sill sealer is used.
      d. Install specified seal sealer under sill plates of exterior walls of main building and of acoustically insulated interior walls.
   6. Posts And Columns:
      a. Unless shown otherwise, nail members of multiple member columns together with 16d at 6 inches (150 mm) on center from each side.
   7. Beams:
      a. Wood shims are not acceptable under ends.
      b. Do not notch framing members unless specifically shown in Drawing detail.
   8. Nailing:
      a. Stud to plate (coordinate with Contract Drawings):

2 by 4 inch nominal	38 by 89 mm	End nail, two 16d OR toe nail, four 8d

2 by 6 inch nominal	38 by 140 mm	End nail, three 16d OR toe nail, four 8d
2 by 8 inch nominal	38 by 184 mm	End nail, four 16d OR toe nail, six 8d
2 by 10 inch nominal	38 by 235 mm	End nail, five 16d OR toe nail, six 8d

b. Top plates: Spiked together, 16d, 16 inches (400 mm) on center.
c. Top plates: Laps, lap members 48 inches (1200 mm) minimum and nail with 16d nails 4 inches (100 mm) on center
d. Top plates: Intersections, three 16d.
e. Backing And Blocking: Three 8d, each end.
f. Corner studs and angles: 16d, 16 inches (400 mm) on center.

F. Roof And Ceiling Framing:
1. Place with crown side up at 16 inches (400 mm) on center unless noted otherwise.
2. Install structural blocking and bridging as necessary and as described in Contract Documents.
3. Special Requirements:
a. Roof And Ceiling Joists: Lap joists 4 inches (100 mm) minimum and secure with code approved framing anchors.
b. Roof Rafters And Outlookers:
1) Cut level at wall plate and provide at least 2-1/2 inches (64 mm) bearing where applicable. Spike securely to plate with three 10d nails.
2) Attach to trusses or other end supports with framing anchors described in Contract Documents.
3) Provide for bracing at bearing partitions.
4. Installation of Trusses:
a. Handle, erect, and brace trusses in accordance with Manufacturer's instructions.
b. Do not install damaged or broken trusses.
c. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
5. Secure headers and header backing to structure as described in Contract Documents.

G. Accessory / Equipment Mounting And Gypsum Board Back Blocking (nailers) for Wood Framing):
1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.

H. Accessory / Equipment Mounting And Standing & Running Trim Blocking (nailers) for Metal Framing:
1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
2. Attach blocking not installed with clips with two fasteners in each end of each piece of blocking.

I. Furring Strips:
1. On Wood or Steel: Nail or screw as required to secure firmly.
a. Ceiling:
1) Attach furring strips to the underside of structural elements with #8 wood screws, of length to penetrate wood framing 1 inch (25 mm) minimum.

END OF SECTION

SECTION 06 1636

WOOD PANEL PRODUCT SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install wood panel product sheathing required for walls, roofs, and floors as described in Contract Documents.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contracts Summary'.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 06 1100: 'Wood Framing'

1.2 REFERENCES

A. Association Publications:
   1. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
      a. Voluntary Product Standard DOC PS 1-09. 'Structural Plywood'.
      b. Voluntary Product Standard DOC PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
   2. The Engineered Wood Association (APA), Tacoma, WA www.apawood.org.
      a. Performance Rated Panels, 'Product Guide' (for products bearing the APA trademark) December 2011.
      b. Voluntary Product Standard:
         1) PS 1-09. 'Structural Plywood'.
         2) PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
      c. PRP-108 'Performance Standards and Policies for Structural-Use Panels'.
   3. TECO, Cottage Grove, WI www.tecotested.com.
      a. TECO PRP-133: ('Fire Rated Assemblies – OSB substitution for plywood in UL fire-rated assemblies that specify plywood).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing sheathing.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Qualification Statements:
      a. Alternate Supplier(s):
         1) Provide name and contact information.
         2) Provide Qualification documentation as requested.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Inspection Reports of sheathing.

1.5 QUALITY ASSURANCE

A. Testing and Inspection:
   1. Owner will provide Testing and Inspection for inspection of sheathing:
      a. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
         1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Do not deliver material unduly long before it is required.
   2. Protect sheathing and keep under cover in transit and at job site.

B. Storage And Handling Requirements:
   1. Store sheathing on level racks and keep free of ground.
   2. Stack to insure proper ventilation and drainage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Performance:
   1. Design Criteria:
      a. Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Contract Drawings, oriented strand board (OSB) is acceptable.

B. Sheathing:
   1. Sheathing:
      a. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
      b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
      c. Sheathing 23/32 inch (18.3 mm) thick and thicker used for single-layer subflooring shall be tongue and groove.
      d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
      e. Minimum span ratings for given thicknesses shall be as follows:

Thickness	Span Rating
3/8 inch	24 / 0
7/16 inch nominal	24 / 16
15/32 inch actual	32 / 16
1/2 inch nominal	32 / 16
19/32 inch actual	40 / 20
5/8 inch nominal	40 / 20
23/32 inch actual	48 / 24
3/4 inch nominal	48 / 24

2.2 ACCESSORIES

A. Nails:
   1. As indicated on Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Top of nail heads shall be flush with sheathing surface.
2. Use of edge clips to provide spacing between sheathing panels is acceptable.

B. Wall Sheathing:
1. Spacing:
   a. Provide 1/8 inch (3 mm) space between sheets at end and edge joints.
2. Edge Bearing And Blocking:
   a. Panel edges shall bear on framing members and butt along their center lines.
   b. Back block panel edges, which do not bear on framing members, with 2 inch nominal (45 mm) framing.
3. Nail Spacing:
   a. As indicated on Contract Drawings.
   b. Place nails not less than 3/8 inch (9.5 mm) in from edge.
4. Thickness:
   a. As indicated on Contract Drawings.
5. Do not install any piece of wall sheathing with shortest dimension of less than 12 inches (300 mm).

C. Roof Sheathing:
1. Placing:
   a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
   b. Provide 1/8 inch (3 mm) space between sheets at end and side joints.
   c. Stagger panel end joints.
   d. Sheathing shall be continuous of two spans minimum.
2. Edge Bearing and Blocking:
   a. As indicated on Contract Drawings.
3. Nail Spacing:
   a. As indicated on Contract Drawings.
   b. Place nails at least 3/8 inch (9.5 mm) in from edge.
4. Thickness:
   a. As indicated on Contract Drawings.
5. Do not install any piece of roof sheathing with shortest dimension of less than 24 inches (600 mm) unless support is provided under all edges.

D. Floor Sheathing:
1. Floor Sheathing: 1 Layer Subflooring (floors accessible to public).
   a. Apply bead of glue to structural supports. Lay face grain / strength axis across supports and with panel continuous over two supports minimum.
   b. Allow expansion gap of at least 1/2 inch (12.5 mm) at walls.
   c. Tongue and Groove.
   d. Nail Spacing.
      1) As indicated on Contract Drawings.
   e. Thickness:
      1) As indicated on Contract Drawings.
   f. Do not install any piece of bottom layer floor sheathing with shortest dimension of less than 24 inches (600 mm).

3.2 FIELD QUALITY CONTROL

A. Field Inspections:
1. Sheathing:

a. General:
   1) Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2) Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
b. For walls and roof areas where nail spacing is 4 inches (100 mm) and less on center, Inspector shall verify wood panel sheathing, grade, thickness and nominal size of framing members, adjoining panel edges, nail size and spacing, bolting and other fastening of other components.

3.3 PROTECTION

A. Protect roof sheathing from moisture until roofing is installed.

END OF SECTION

SECTION 06 1643

GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install exterior gypsum sheathing required for exterior walls as described in Contract Documents.

1.2 REFERENCES

A. Definitions:
   1. Flame Spread Classification: Standard rating of relative surface burning characteristics of a building material as compared to a standard material.
   2. Gypsum Sheathing: Gypsum board used as a backing for exterior surface materials, manufactured with water-repellant paper and may be manufactured with a water-resistant core.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C1002-18, 'Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs'.
      b. ASTM C1177/C1177M-17, 'Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing'.
      c. ASTM C1280-18, 'Standard Specification for Application of Gypsum Sheathing'.
      d. ASTM D3273-16, 'Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber'.
      e. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
      f. ASTM E119-18c, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
   2. Gypsum Association:
      a. GA-253-07, 'Application of Gypsum Sheathing'.
      b. GA-254-07, 'Fire-Resistant Gypsum Sheathing'.
   3. Underwriters Laboratories (UL):
      a. UL 263: 'Test Method for Building Construction and Materials' (14th edition).
      b. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's specifications and installation instructions for each product specified.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final, executed copy of Warranty.
      b. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's literature or cut sheet.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Burning Characteristics:
      a. Meet requirements of ASTM E84 or UL 723.
   2. Fire-Test-Response Characteristics:
      a. For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 or UL 263 by testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Store materials stacked flat on leveled supports off ground to prevent sagging or damage to edges, ends and surfaces.
   2. Protect materials against damage from weather, direct sunlight exposure, surface contamination, construction traffic, or other causes.
   3. Follow Manufacturer's recommendations for protecting materials against mold from water exposure during storage, installation or after completion.

1.6 WARRANTY

A. Manufacturer Warranty:
   1. Defects:
      a. Manufacturer's five (5) year Limited Warranty against defects.
   2. Exposure:
      a. Manufacturer's twelve (12) month Limited Warranty that product will withstand exposure to normal weather conditions when stored and installed according to Manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Manufacturer Contact List:
      a. CertainTeed Gypsum, Inc, Tampa, FL www.certainteed.com.
      b. Georgia Pacific Gypsum Corp, Atlanta, GA www.gp.com.
      c. USG, Chicago, IL www.usg.com.

B. Gypsum Sheathing Board:
   1. Description:
      a. Gypsum Sheathing is manufactured with a water resistive gypsum core with paper. Gypsum sheathing is intended for use as a substrate under exterior wall claddings in any climate.
   2. Design Criteria:
      a. Non-fire-rated and fire rated exterior wall construction as noted on drawings:
         1) Meet requirements of ASTM C1177/C1177M, thickness as indicated on drawings, faced with water-resistant facing material front and back, and having treated core.
         2) Meet Burning Characteristics and Fire-Test Response Characteristics as specified in Quality Assurance in Part 1 of this specification.
         3) Meet mold resistance requirements of ASTM D3273: 10, in a test as manufactured.
         4) Approved Product. See Section 01 6200.

a) DensGlass Sheathing by Georgia Pacific.
b) GlasRoc Sheathing by CertainTeed.
c) Securock Glass-Mat by USG.

2.2 ACCESSORIES

A. Fasteners:
1. Bugle head screws as recommended by Sheathing Manufacturer and meeting requirements of ASTM C1002, corrosion resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Inspection:
a. Examine substrate and verify framing is suitable for installation of sheathing:
1) Notify Architect of unsuitable conditions in writing.
2) Do not install sheathing over unsuitable conditions.
3) Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

A. General:
1. Non-fire-rated exterior wall construction:
a. Comply with requirements of ASTM C1280, or GA-254, and Manufacturer's written instructions.

B. Walls:
1. Fastening:
a. Apply from center of wallboard towards ends and edges.
b. Do not apply screws closer than 3/8 inch (9.5 mm) to ends or edges. Screws on adjacent ends or edges shall be opposite each other. Space screws not over 6 inches (150 mm) on center.
c. Adjust power screw-driver to set heads in 1/32 inch (0.8 mm) dimple.
d. Drive screws with shank perpendicular to face of board.
2. Single Layer Application:
a. Use board of size to give minimum number of joints.
b. Edge joints to be parallel to and occur over framing members.
c. Butt edges in moderate contact. Do not force in place.
d. Leave facings true with joint, finishing flush, vertical work plumb.
3. Sealing Sheathing Joint/Penetrations:
a. Seal as required, according to Sheathing Manufacturer's written recommendations.

C. Gypsum Board used with Soffits: Eliminate control and taped joints where board is sheathed with aluminum.

3.3 PROTECTION

A. Gypsum Sheathing used with EIFS:
1. Follow Manufacturer's recommendation for protecting gypsum sheathing from moisture and deterioration damage until air barrier, structural sheathing or exterior finish system is installed.

END OF SECTION

SECTION 06 2001

COMMON FINISH CARPENTRY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Architectural Woodwork.
   2. Handrails.
   3. Factory Manufactured Access Doors.
   4. Fixed Shelving not part of casework.
   5. Plastic Laminate Countertops.
   6. Selected Building Specialties.
   7. Windows.
   8. Wood Stairs.
   9. Miscellaneous as specified elsewhere.

C. Related Requirements:
   1. Section 06 1100: 'Wood Framing' for furring and blocking.
   2. Section 06 1636: 'Wood Panel Product Sheathing'.
   3. Section 06 4001: 'Common Architectural Woodwork Requirements':
      1) Approved Fabricators.
      2) Quality of wood materials to be used in Finish Carpentry.
   4. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
   5. Section 08 3110: 'Access Doors And Panels' for furnishing of Factory Manufactured Access Doors.
   6. Sections under 09 9000 heading: Back priming of work to be installed against concrete or masonry or subjected to moisture, and finishing of finish carpentry and architectural woodwork.
   7. Sections in Division 10: Furnishing of Specialties.
   8. Sections in Division 11: Furnishing of Equipment.

1.2 REFERENCES

A. Association Publications:
   1. Architectural Woodwork Institute / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
      a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.

B. Definitions:
   1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
      a. Economy Grade: The lowest acceptable grade in both material and workmanship requirements, and is for work where price outweighs quality considerations.
      b. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
      c. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.

C. Reference Standards:
1. ASTM International:
a. ASTM C578-18, 'Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation'.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
1. Manufacturer Contact List:
a. Blum Inc, Stanley, NC www.blum.com.
b. Bommer Industries, Landrum, SC www.bommer.com.
c. CompX National, Mauldin, SC www.nclnet.com.
d. Dow Chemical, Midland, MI www.dow.com.
e. Flynn & Enslow, San Francisco, CA www.flynnenslow.com.
f. Grass America Inc, Kernersville, NC www.grassusa.com.
g. Hafele America Co., Archdale, NC hafele.com.
h. Hillside Wire Cloth Co., Inc., Bloomfield, NJ www.hillsidewirecloth.com.
i. Ives, Indianapolis, IN www.iveshardware.com.
j. Knape & Vogt, Grand Rapids, MI www.knapeandvogt.com
k. Olympus Lock Co, Seattle, WA www.olympus-lock.com.
l. Owens Corning, Toledo, OH www.owens-corning.com.
m. Salice America Inc, Charlotte, NC www.saliceamerica.com.
n. SOSS Door Hardware (Division of Universal Industrial Products Company) Pioneer OH www.soss.com.
o. Stanley, New Britain, CT www.stanleyhardware.com
p. TWP Inc., Berkley, CA www.twpinc.com.
q. Wire Cloth Manufacturers Inc., Mine Hill, NJ www.wireclothman.com.

B. Glue: Waterproof and of best quality.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Verify walls, ceilings, floors, and openings are plumb, straight, in-line, and square before installing Architectural Woodwork.
2. Report conditions that are not in compliance to Architect before starting installation.

3.2 PREPARATION

A. Surface Preparation:
1. Install Architectural Woodwork after wall and ceiling painting is completed in areas where Architectural Woodwork is to be installed.

B. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.

3.3 INSTALLATION

A. Special Techniques:

1. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for installation of architectural woodwork.

B. General Architectural Woodwork Installation:
   1. Fabricate work in accordance with measurements taken on Project site.
   2. Scribe, miter, and join accurately and neatly to conform to details.
   3. Exposed surfaces shall be machine sanded, ready for finishing.
   4. Allow for free movement of panels.
   5. Countersink nails. Countersink screws and plug those exposed to view.
   6. Attach custom casework as specified in Sections under 06 4000 Heading: 'Furnishing of Architectural Woodwork' to wall blocking with #10 x 3 inch (76 mm) minimum Cabinet Screws. Attach wall cabinets with screws equally spaced horizontally not to exceed 12 inches (305 mm) O.C. with 3 inch (76 mm) maximum spacing at cabinet edges.

END OF SECTION

SECTION 06 2024

DOOR, FRAME, AND FINISH HARDWARE INSTALLATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
   1. Furnish and install sealants for caulking door frames as described in Contract Documents.
   2. Furnish and install insulation in doorframes as described in Contract Documents.

B. Products Installed but Not Furnished Under This Section:
   1. Flush wood doors.
   2. Hollow metal doors.
   3. Hollow metal door frames.
   4. Finish hardware.

C. Related Requirements:
   1. Sections under 04 2000 heading: Grouting of frames installed in masonry walls.
   2. Section 07 2116: ' Blanket Insulation' for quality of fiberglass insulation.
   3. Section 07 9213: ' Elastomeric Joint Sealants' for quality of sealants.
   4. Sections under 08 1000 heading: Furnishing of doors and metal frames.
   5. Sections under 08 7000 heading: Furnishing of finish hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference.
   1. Participate in pre-installation conference.
   2. In addition to agenda items specified in Section 01 3100, review following:
      a. Schedule conference after hardware has been delivered to site and organized into hardware groups by door, but before installation of hardware.
      b. Check for appropriate blocking and for correct hardware models and fasteners for substrates.
      c. Review submittals and set of Manufacturer's installation, adjustment, and maintenance instructions submitted under Section 08 7101.
      d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Installer Report:
      a. Report verifying correct operation and adjustment of installed hardware.
   2. Special Procedure Submittals:
      a. Copy of 'Installation Guide for Doors & Hardware' by Door & Hardware Institute. Guide may be obtained from Door and Hardware Institute (DHI).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Wood Doors:

a. Do not have doors delivered to building site until after plaster, cement, and taping compound are dry.
b. If doors are to be stored at job-site for more than one week, seal top and bottom edges if not factory sealed.

2. Metal Frames:
a. Examine door frames and note damage upon acceptance.

B. Storage And Handling Requirements:
1. Wood Doors:
a. Store flat on a level surface in a dry, well ventilated building.
1) Cover to keep clean but allow air circulation
b. Handle with clean gloves and do not drag doors across one another or across other surfaces.
c. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein
1) Condition doors to average prevailing humidity of locality before hanging.
2. Metal Frames:
a. Protect metal frames from damage before and during installation.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames:
1. Site Tolerances:
a. Squareness: 1/16 inch (1.6 mm) from top edge to opposite top edge.
b. Plumbness: 1/16 inch (1.6 mm) from top of jamb to bottom of jamb.
c. Alignment: 1/16 inch (1.6 mm) from plane of left side face of jamb to right side face of jamb.
d. Twist: 1/16 inch (1.6 mm) across throat of jamb plane measured across each face to plane of opposite jamb throat.
e. Finished Clearance Between Door And Frame:
1) 1/16 inch (1.6 mm) at head and hinge jamb plus 1/16 inch (1.6 mm) maximum
2) 1/8 inch (3 mm) at strike jamb plus or minus 1/16 inch (1.6 mm) maximum.
3) 1/2 inch (12.7 mm) to top of finished floor surface or 1/4 inch (6 mm) to top of threshold, plus or minus 1/16 inch (1.6 mm) maximum.
2. Set frame in location and level head.
a. Use of crowbar or other prying device to set door frame into wall opening will damage door frames and are not permitted to be used.
3. Equalize with adjustable floor anchor.
4. Set spreaders and fasten jambs to floor and wall.
a. Wood spreaders shall be square, fabricated from lumber one inch minimum thick, be same length as door opening at header, and same depth as frame.
b. Cut notches for frame stops.
c. Do not remove spreaders until frames are permanently anchored in wall.
d. Use one spreader at base of frame and another at strike level.
e. Do not use temporary spreaders welded to base of jambs during installation of frame.
5. Fill gap between frame and framing with urethane foam or tightly-packed fiberglass insulation. If urethane foam is used, foam interior of frames before installing frame. Trim excess before installation of frame.
6. Caulking:
a. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
b. Caulk around both sides of frames installed in exposed masonry walls with specified sealant.

B. Doors:

1. When Project is completed, doors shall not bind, stick, or be mounted so as to cause future hardware difficulties.
2. Do not impair utility or structural strength of door in fitting of door, applying hardware, or cutting and altering door louvers, panels, or other special details.

C. Hardware:
   1. General:
      a. Install using set of Manufacturer's installation, adjustment, and maintenance instructions submitted with hardware under Section 08 7101. Follow as closely as possible.
      b. Mount closers on jamb stop side of door in parallel arm configuration where it is physically possible to do so and not damage or hinder operation of door or closer.
   2. Hardware for Wood Doors:
      a. If doors are not factory-machined, use hardware templates furnished by Hardware Manufacturer when mounting hardware.
      b. Set hinges flush with edge surface. Be sure that hinges are set in a straight line to prevent distortion.
      c. Mount door latches high in strike plate opening so when door later settles, latch will not bind.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Arrange to have keys brought to Project site and, in meeting attended by local representatives and Architect, test every new key and locking mechanism.

B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
   2. Door frames:
      a. Door frames damaged by use of crowbar or other prying devices to set door frames shall be repaired or replaced at no additional cost to Owner.

3.3 CLOSEOUT ACTIVITIES

A. Instruction of Owner:
   1. Using Owner's Operations And Maintenance Manual, explain keying systems at same time keys and locking mechanisms are tested.

B. Key Delivery:
   1. Immediately before Final Acceptance Meeting, turn change keys over to Owner properly organized, tagged, and placed in new or existing key cabinet.

END OF SECTION

SECTION 06 4001

COMMON ARCHITECTURAL WOODWORK REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
   1. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.

B. Related Requirements:
   1. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.
   2. Section 06 4005: ‘Plastic Laminate’.
   3. Section 06 6001: ‘Miscellaneous Plastic Fabrications’.

1.2 REFERENCES

A. Association Publications:
   1. Architectural Woodwork Institute / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
      a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.

B. Definitions:
   1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
      a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project’s quality of materials, workmanship, or installation.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's literature for specialty items and hardware not manufactured by Architectural Woodwork fabricator.
   2. Shop Drawings:
      a. Fabricator:
         1) Provide shop drawings for cabinet and casework that are included for project showing details, casework locations and layout in compliance with Contract Drawings.

B. Informational Submittals:
   1. Qualification Statement:
      a. Fabricator:
         1) Provide Qualification documentations as requested.

1.4 QUALITY ASSURANCE

A. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
   1. Fabricator:
      a. Fabricator Firm specializing in performing work of this section.
         1) Firm experience in supplying products indicated for this Project.

2) Firm with sufficient production capacity to produce required units.
3) Firm will comply with specifications and Contract Documents for this Project.
4) Minimum five (5) years experience in Woodwork installations.
5) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and installation procedures required for this project before bidding.

b. Upon request by Architect or Owner, submit documentation.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:
1. Assemble architectural woodwork at Architectural Woodwork Fabricator's plant and deliver ready for erection insofar as possible.
2. Protect architectural woodwork from moisture and damage while in transit to job site.
3. Report damaged materials received within two (2) days from delivery at project site.

B. Storage And Handling Requirements:
1. Unload and store in place where it will be protected from moisture and damage and convenient to use.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Approved Fabricators:
1. Meet Quality Assurance Fabricator Qualifications.

B. Architectural Woodwork Fabricators shall be pre-approved.

2.2 ASSEMBLIES

A. Design Criteria:
1. General:
a. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for materials, construction, and installation of architectural woodwork.
2. Materials:
a. Lumber:
1) Grade:
a) No defects in boards smaller than 600 sq in (3 871 sq cm).
b) One defect per additional 150 sq inches (968 sq cm) in larger boards.
c) Select pieces for uniformity of grain and color on exposed faces and edges.
d) No mineral grains accepted.
2) Allowable Defects:
a) Tight knots not exceeding 1/8 inch (3 mm) in diameter. No loose knots permitted.
b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches (450 mm).
c) Checks or splits not exceeding 1/32 inch by 3 inches (1 mm by 75 mm) and not visible after finishing when viewed beyond 18 inches (450 mm).
d) Stains, pitch pockets, streaks, worm holes, and other defects not mentioned are not permitted.
e) Normal grain variations, such as cats eye, bird's eye, burl, curl, and cross grain are not considered defects.
3) Use maximum lengths possible, but not required to exceed 10 feet (3 meters) without joints. No joints shall occur closer than 72 inches (1 800 mm) in straight runs exceeding 18 feet (3 600 mm). Runs between 18 feet (3 600 mm) and 10 feet (3

meters) may have no more than one joint. No joints shall occur within 72 inches (1 800 mm) of outside corners nor within 18 inches (450 mm) of inside corners.

4) Moisture content shall be six (6) percent maximum at fabrication. No opening of joints due to shrinkage is acceptable.

B. Fabrication:
   1. Follow Architectural Woodwork Standards (AWS) for fabrication of Architectural Woodwork.
   2. Tolerances:
      a. No planer marks (KCPI) allowed. Sand wood members and surfaces with 100 grit or finer.
      b. Maximum Gap: None allowed.
      c. Flushness Variation: 0.015 inch (0.4 mm) maximum.
      d. Sanding Cross Scratches: 1/4 inch (6 mm) maximum.
      e. Plug screw holes. Screw locations not to be visible beyond 18 inches (450 mm).
   3. Fabricate work in accordance with measurements taken on job site.
   4. 'Ease' sharp corners and edges of exposed members to promote finishing and protect users from slivers. Radius of 'easing' shall be uniform throughout Project and between 1/32 and 1/16 of an inch (0.8 and 1.6 of a millimeter).
   5. Fabricate so veneer grain is vertical.
   6. Joints:
      a. Use lumber pieces with similar grain pattern when joining end to end.
      b. Compatibility of grain and color from lumber to panel products is required.
   7. Install hardware in accordance with Manufacturer's directions. Leave operating hardware operating smoothly and quietly.
   8. Remove or repair damaged surface of or defects in exposed finished surfaces of architectural woodwork to match adjacent similar undamaged surface.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 4005

PLASTIC LAMINATE

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Wall-hung counters.
   2. Countertops for custom casework.

B. Related Requirements:
   1. Section 06 2001: 'Common Finish Carpentry Requirements':
      a. Installation of wall-hung counters.
      b. Installation of countertops for custom casework.
   2. Section 06 4001: 'Common Architectural Woodwork Requirements':
   3. Sections Under 22 4200 Heading: Plumbing Fixtures.

1.2 REFERENCES

A. Association Publications:
   1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
      a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.

B. Definitions:
   1. Flame Spread: The propagation of flame over a surface.
      a. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
   2. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
      a. Premium Grade: Highest Grade available in both material and workmanship where highest level of quality, materials, workmanship, and installation is required.
   3. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Also known as Plastic Laminate.
   4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.

C. Reference Standards:
   1. ASTM International:
      a. ASTM E84-18, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
      b. ASTM E162-15a, 'Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source'.
   2. Kitchen Cabinet Manufacturers Association:
      a. ASTM/KCMA A161.1-2012, 'Performance And Construction Standards For Kitchen And Vanity Cabinets'.
   3. National Electrical Manufacturer's Association / American National Standards Institute:
      a. ANSI/NEMA LD-3-2005, 'High Pressure Decorative Laminates'.
   4. Underwriters Laboratories, Inc.:
      a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (10th Edition).

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Color selections.
      b. Manufacturer's technical data sheet.

B. Informational Submittals:
   1. Certificates:
      a. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
   2. Test And Evaluation Reports:
      a. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties for Quality Assurance if requested by Owner or Architect.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's literature for plastic laminate.
            b) Color selections.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
      a. Surface-Burning Characteristics:
         1) Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
            a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
            b) Flash point: None.

1.5 WARRANTY

A. Manufacturer Extended Warranty:
   1. Approved Fabricator’s written guarantee that all Goods and Services will be free from defects in materials and workmanship for a period of five (5) years from date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Acceptable Manufacturers:
      a. Formica, Cincinnati, OH www.formica.com or Formica Canada Inc, St Jean sur Richelieu, PQ (450) 347-7541, all matte finish.
      b. Nevamar, Odenton, MD www.nevamar.com.
      c. Pionite Decorative Surfaces, Auburn, ME www.pionite.com.
      d. WilsonArt, Temple, TX www.wilsonart.com or WilsonArt International Inc, Mississuaga, ON (905) 565-1255.
      e. Equal as approved by Architect before bidding. See Section 01 6200.

B. Plastic Laminates:
   1. Design Criteria:

a. Countertops:
   1) Post-formed front edge and backsplash, except where detailed otherwise, with plastic laminate meeting requirements of ANSI/NEMA LD 3: PF 42.
      a) Vertical Applications: GP 28.
      b) Horizontal (other than countertops): GP 38.
   2) No raised lip on front edge.
b. Balancing Material: BK 20.
c. AWS Quality Grade: Premium.

2. Assemblies:
   a. Countertops shall meet requirements of KCMA A161.1.
   b. Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.
3. Color as selected and approved by Architect.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 41 16
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

1. PART 1 - GENERAL

1.1 SUMMARY

DESCRIPTION	SPECIFIED MFRS	APPROVED MFRS	COMMENTS
Casework	W.I.C. Grade		Plastic laminate casework & countertops- typical. No hollow areas.

A. Related Requirements:
B. Countertops.
D. Cabinet hardware.

MANUFACTURERS:

A. Avonite, Inc., Product: Avonite
B. Diamond Surfaces USA, Product: Solid Surface
C. E.I. DuPont de Nemours and Co., Inc., Product: Corian
D. Formica Corporation, Product: Solid Surfacing
E. LG Chemical, Product: Hi-Macs
F. Wilson Art, Product: Earthstone/Gibraltor

1.2 REFERENCES

A. WI - Woodwork Institute of California: Architectural Woodwork Standards.

B. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. ASTM A653 - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot- Dip Process.

D. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

E. ASTM C615 – Standard Specification for Granite Dimension Stone.

F. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.

G. CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.3 QUALITY ASSURANCE - MONITORED COMPLIANCE PROGRAM

A. Manufacture casework items in accordance with quality standards of the Architectural Woodwork Standards of the Woodwork Institute.

B. All millwork and the installation of millwork shall be monitored for compliance under the scope of the WI Monitored Compliance Program (MCP).

C. Fees charged by the Woodwork Institute for their monitored compliance service are the responsibility of the casework manufacturer.

D. Provide WI Inspection Service at the millwork fabricator. Provide to Architect a written report showing the results of the inspection.

E. Provide WI Certified Compliance Labels on all items of casework and countertops.

F. Provide WI Inspection Service at the job site. Provide to Architect a written report showing the results of the inspection.

G. Self-Certification by the millwork fabricator or inspection by other than an authorized representative of The Woodwork Institute is not acceptable.

H. Upon completion of the installation, provide a WI Monitored Compliance Certificate.

1.4 QUALITY ASSURANCE - CERTIFIED SEISMIC INSTALLATION PROGRAM

A. Install casework items in accordance with the Woodwork Institute's Certified Seismic Installation Program (CSIP).

B. Install casework in accordance with the Office of Statewide Health Planning and Development (OSHPD) Preapproval of Fixed Equipment Anchorages (OPA-2649-10).

C. Prior to walls being closed up and covered, provide a written Woodwork Institute Certified Seismic Installation report confirming that backing is provided in all locations required for casework installation. Identify those areas where backing is missing or improperly located.

D. On completion of installation of casework provide a Woodwork Institute Certified Seismic Installation Program Certificate. Identify the work covered and certify that the work as installed is in compliance with the requirements of the Woodwork Institute's Certified Seismic Installation Program (CSIP).

E. Fees charged by the Woodwork Institute for monitoring and compliance for their Certified Seismic Installation Program (CSIP) are the responsibility of the casework manufacturer and installer.

1.5 REGULATORY REQUIREMENTS

A. Conform to CBC requirements for flame spread classification in accordance with CBC Section 803 and Table 803.5.

B. Conform to Flame Spread Classifications for Interior Millwork for flame spread ratings as tested according to ASTM E84.

1.6 MOCKUP

A. Prepare mockup under provisions of Section 01 43 00.

B. Provide full size base cabinet and upper cabinet of each type indicated, in specified finish with hardware installed.

C. Units will be examined to ascertain quality and conformity to WI standards.

D. Units will establish a minimum standard of quality for this work.

E. Approved units may be used as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site under provisions of Section 01 61 00.

B. Delivery of casework shall be made only when the area of installation is enclosed, all plaster and concrete work is dry, the area is broom clean and environmental conditions are as specified.

1.8 ENVIRONMENTAL CONDITIONS

A. Area of casework installation shall be fully enclosed, well ventilated, and protected from direct sunlight, excessive heat, rain or moisture.

B. Relative humidity of the area of casework installation shall be maintained between 45 percent and 65 percent with a temperature range of between 60 degrees F to 90 degrees F.

C. Casework shall be acclimated to the area of installation for a minimum of 72 hours prior to installation.

1.9 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

C. Provide WI Certified Compliance Label for the Certified Seismic Installation Program on the first page of shop drawings.

D. Provide WI Certified Compliance Label on first page of shop drawings. Include WI inspector's signature.

E. Provide WI certificates of compliance and inspection reports.

2. PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this section www.woodworkinstitute.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 CABINET DESIGN

A. Individual cabinets are indicated on the drawings by the WI Cabinet Design Series (CDS) numbering system, Appendix A.

2.3 MODULAR CASEWORK - LAMINATED PLASTIC COVERED

A. Fabricate in accordance with Section 10 of the Manual of Millwork:

1. WI Grade:	Custom.
2. Core Material:	Combination Core, PureBond Classic Core, www.columbiaforestproducts.com.
3. Type:	Type A.
4. Construction:	Style A-Frameless.
5. Joinery:	Doweled Joints.
6. Cabinet Backs:	Blind Dadoed.
7. Cabinet Door Type:	Interface Style 1, Type A, flush overlay.
8. Shelves:	1-M-2 particle board, 1 inch thick, MOE of 950, capable of supporting 50 lb/sq ft load with deflection of L/144.

9. Shelf Edge Bands	1mm PVC in color to match shelf. All 4 edges of adjustable shelves to receive banding.
10. Door and Drawer Edge Bands:	3mm PVC radiused 1/8 inch at edge. Solid color as selected by Architect.
11. Exposed Surfaces (Including shelves and interior of open front cabinets):	0.028 inch high pressure plastic laminate, color and pattern as selected by Architect. A maximum of 5 colors and patterns to be selected. A minimum of 3 color combinations per room may be selected.
12. Semi-Exposed Surfaces (Behind doors and inside drawers):	Low pressure decorative polyester or melamine laminate ALA-85.
13. Security and Dust Panels:	Particle board, 3/4 inch thick at all lockable drawers.

Particle board, 3/4 inch thick at all lockable drawers.

2.4 SOLID SURFACE WILSONART LAMINATED PLASTIC COUNTERTOPS

A. Fabricate in accordance with Section 11 of the Architectural Woodwork Standards.

1.	WI Grade:	Premium.
2.	Core Thickness:	0.75 inch minimum.
3.	Laminate Thickness:	0.050 inch or .042 inch for postformed use.
4.	Front Edge Covering:	Full round.
5.	Backsplash at Top:	Horizontal butt.
6.	Top of Back Splash:	Square with scribe.
7.	Construction Type:	Assembly 2, deck mount, manufacturer assembled.
8.	Plastic Colors and Pattern:	To be selected from standard patterns, satin finish.
9.	Laboratory Tops, Splashes and Reagent Shelves:	Acid resistant laminated plastic.

2.5 STAINLESS STEEL COUNTERTOPS

A. Stainless Steel: ASTM A167, Type 304, No. 4 finish, with 18 gage thick.

B. Core: Particleboard, minimum 3/4 inch thick.

C. Edge: Marine edge, 1-1/2 inch total thickness.

D. Backsplash: Integral cove with corners radiused 1-1/2 inch total thickness.

E. Seams: Continuous welded seams. Grind smooth.

2.7 SOLID POLYMER COUNTERTOPS

A. Manufacturers:

1. Avonite, Inc., Product: Avonite, www.avonite.com.
2. Diamond Surfaces USA, Product: Solid Surface, www.diamondsurfaces.com.
3. E.I. duPont de Nemours and Co., Inc., Product: Corian, www.corian.com.
4. Formica Corporation, Product: Solid Surfacing, www.formica.com.
5. LG Chemical, Product: Hi-Macs, www.hi-macs.com.
6. WilsonArt, Product: Earthstone/Gibraltor, www.wilsonart.com.
7. Substitutions: Under provisions of Section 01 25 13.

B. Fabricate solid polymer tops and splashes in accordance with the following:

2.8 SOLID SURFACE COUNTERTOPS

A. Manufacturer:

1. Arizona Tile or Architect approved equal
2. Substitutions: Under provisions of Section 01 25 13.

B. Fabricate solid surface countertops in accordance with the following:

1.	Top Thickness	:	3/4 inch
2.	Edge	:	1 & ½ square with 1/4 inch top bevel and with drip groove.
3.	Backsplash	:	3/4 inch thick. Square butt. 1/4 inch bevel at top edge.
4.	Color	:	To be selected from manufacturer's entire range of colors.

2.11 HARDWARE – PRODUCTS SET THE QUALITY STANDARD. OTHER MANUFACTURERS ARE PERMITTED WITH ARCHITECT'S APPROVAL

A. Finish: Satin Aluminum.

B. Shelf Supports: Metal or molded polycarbonate clips set in drilled holes spaced 32 mm on center. Clips to have vertical locating pin for retention of shelf.

C. Drawer and Door Pulls: Epco DP-412 flush mortise pull.

D. Cabinet Locks: Olympus 500/600 or CompXNational 8173/8178.

E. Drawer Slides for Drawers 24 inch Wide or Less: Accuride 7432.

F. Drawer Slides for Drawers over 24 inch Wide: Accuride 3640.

G. Drawer slides for File Drawers: Accuride 4034.

H. Hinges: Rockford Process Control, No. 851, or Terry Hinge H08-99L60, heavy duty wrap-around, extended panel, tight pin butts of steel, 2-3/4 inch minimum width with companion magnetic door catch capable of a minimum 10 pound pull capacity. Hinges per leaf: 3'-0" high doors - 2 hinges, 3'-0" to 5'-0" high doors - 3 hinges, 5'-0" to 7'-4" high doors - 4 hinges, 7'-0" to 8'-0" - 5 hinges.I. Magnetic Door Catch: Epco 591/592.

J. Sliding Door Track Assemblies: Grant 2023N sheaves and Grant 2011 track.

K. Grommets: Doug Mockett and Company, Inc., www.mockett.com. SG Series; plastic 1-3/4 inch diameter,
20 required. LO Series; plastic 6 x 3 inch 4 required. CP Series; plastic 17 x 1-3/4 inch, 4 required. Colors as selected by Architect.

L. Hanger Rods: 1-1/16 inch diameter tubing, stainless steel.

M. Seismic Shelf Lip: 1/4 inch thick x 3 inch high acrylic plastic or PVC edging of color selected by Architect. Ease all edges of plastic.

N. Countertop Support Bracket: 24 inch x 24 inch x 1/8 inch thick pre-manufactured angled steel bracket, black paint finish, minimum 1,000 lb. load support capability, with 7 predrilled anchor holes per bracket leg. Manufactured by A & M Hardware, Inc. www.aandmhardware.com

O. Remainder of hardware required shall meet requirements of ANSI/BHMA Grade

P. Substitutions: Under the provisions of Section 01 25 13.

2.12 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

D. Provide all supports and required inserts for laboratory type sink units.

E. Install plastic grommets in the field in plastic laminate casework and Owner furnished furniture as directed by the Owner's Representative and/or Architect.

F. Install seismic shelf lips on all exposed edges of open shelving with flathead countersunk wood screws spaced 6 inches on center. Finish exposed screw heads to match color of shelf lip.

G. Install one adjustable shelf for each 1'-0" of height for all wall mounted cabinets.

H. Provide stretcher at top face of all door and drawer fronts.

I. Provide locks on all doors and drawers.

3. PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Set and secure casework in place rigid, plumb, and level.

B. Install casework in accordance with Section 10 and Appendix B of the Architectural Woodwork Standards.

C. Install countertops in accordance with Section 11 and Appendix B of the Architectural Woodwork Standards.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.

B. Clean casework, counters, shelves, hardware, fittings and fixtures.

SECTION 06 6116
SOLID SURFACE FABRICATIONS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:

1. Countertops with sinks
2. Lavatory tops with undermount bowls

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications” for Blocking.
2. Division 6 Section “Rough Carpentry” for Blocking.
3. Division 10 Section “Toilet Partitions.”
4. Division 15 Section “Plumbing Fixtures.”

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Shop drawings:

1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
   a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
   b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
   c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Samples:

1. For each type of product indicated.
   a. Submit minimum 6-inch by 6-inch sample in specified gloss.
   b. Cut sample and seam together for representation of inconspicuous seam.
   c. Indicate full range of color and pattern variation.
2. Approved samples will be retained as a standard for work.

D. Product data:

1. Indicate product description, fabrication information and compliance with specified performance requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:

1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
1. Standards of the following, as referenced herein:
a. American National Standards Institute (ANSI)
b. American Society for Testing and Materials (ASTM)
c. National Electrical Manufacturers Association (NEMA)
d. NSF International
2. Fire test response characteristics:
a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
1) Flame Spread Index: 25 or less.
2) Smoke Developed Index: 450 or less.

D. Drawings shall:
1. Be produced in 1/2-inch scale for all fabricated items.

E. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.
1. No review or approval will be forthcoming.
2. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
1. Warranty shall provide material and labor to repair or replace defective materials.
2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Manufacturer's warranty period:
1. Ten years from date of substantial completion.

1.8 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following:
a. Corian® surfaces from the DuPont company (basis of design).

2.2 MATERIALS

A. Solid polymer components
1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:
1. 1/2 inch
C. Backsplash:
1. Coved.
D. Sidesplash:
1. Coved.

I. Performance characteristics:

Property	**Typical Result**	**Test**
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell “M” Scale
	56	ASTM D 785 Barcol Impressor
Thermal Expansion	3.02 x 10^{-5} in./in./°C (1.80 x 10^{-5} in./in./°F)	ASTM D 2583 ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact	No fracture—1⁄2 lb. ball:	NEMA LD 3-2000
Resistance: Sheets	1⁄4" slab—36" drop 1⁄2" slab—144" drop	Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3⁄4") 0.6% (1⁄2") 0.8% (1⁄4")	ASTM D 570
Toxicity	99 (solid colors)	Pittsburgh
Protocol	66 (patterned colors)	Test (“LC50”Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723

Flame Spread Index	<25
Smoke Developed Index	<25

† Approximate weight per square foot: 1⁄4" (6 mm) 2.2 lbs., 1⁄2" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:
1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:
1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

C. Sink/lavatory mounting hardware:
1. Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.

D. Conductive tape:
1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

E. Insulating felt tape:
1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 FACTORY FABRICATION

A. Shop assembly
1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
    a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
    a. Rout cutouts, radii and contours to template.
    b. Smooth edges.
    c. Repair or reject defective and inaccurate work.

B. Thermoforming:
1. Comply with manufacturer's data.
2. Heat entire component.
    a. Material shall be uniform, between 275 and 325 degrees Fahrenheit during forming.
3. Form pieces to shape prior to seaming and joining.
4. Cut pieces to finished dimensions.
5. Sand edges and remove nicks and scratches.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.
1. Color: As indicated on Sheet F-101, Finishes Plan.

B. Finish:
1. Provide surfaces with a uniform finish.
    a. Matte; gloss range of 5–20.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
    1. Provide product in the largest pieces available.
    2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
    a. Exposed joints/seams shall not be allowed.
    3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
    4. Cut and finish component edges with clean, sharp returns.
    5. Rout radii and contours to template.
    6. Anchor securely to base cabinets or other supports.
    7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
    8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
    9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
B. Coved backsplashes and applied sidesplashes:
    1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
    2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.
C. Coved backsplashes and sidesplashes:
    1. Provide coved backsplashes and sidesplashes at all walls and adjacent millwork.
    2. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on the drawings.
    3. Adhere to countertops using manufacturer's standard color-matched Joint Adhesive.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.
B. Remove adhesives, sealants and other stains.

END OF DOCUMENT

SECTION 07 2116

BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install faced thermal and acoustic batt insulation as described in Contract Documents.
   2. Quality of insulation used in speaker enclosures.

B. Related Requirements:
   1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for furnishing and installing of insulation in hollow metal door frames.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM C665-17, ‘Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Insulation shall be manufactured and installed in compliance with California Building Code (CBC) or other applicable building codes.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
   1. Insulation:
      a. Acceptable Manufacturers:
         1) Certainteed Corp, Valley Forge, PA www.certainteed.com.
         2) FiberTEK, Salt Lake City, UT www.fibertekinsulation.com.
         3) Guardian Fiberglass, Greer, SC www.guardianbp.com.
         4) Johns Manville, Denver, CO www.jm.com.
         5) Knauf Fiber Glass, Shelbyville, IN www.knaufusa.com.
         6) Owens-Corning Fiberglass Corporation, Toledo, OH www.owens-corning.com.
         7) Thermafiber, Wabash, IL www.thermafiber.com.
      b. Equal as approved by Architect before bidding. See Section 01 6200.

B. Materials:
   1. Thermal And Acoustic Insulation:
      a. Order insulation by 'R' value rather than 'U' value, rating, or thickness, either 16 or 24 inches (400 or 600 mm) wide according to framing spacing.
      b. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
         1) Support at trussed rafters:

a) Provide support at trussed rafters where insulation is not enclosed by structure or drywall.
b) Provide stings/wires which run perpendicular to framing and attach at each trussed rafter and to framing at 32 inches (800 mm) O.C. minimum and where batt ends adjoin each other.

or

c) Quality Standard: Simpson Strong Tie IS Insulation Supports with 14 gauge (1.89 mm) carbon steel, spring wire and mitered tips for 16 inch (400 mm) O.C. and 24 inch (610 mm) O.C. spacing.

c. 'R' Value Required:
1) Acoustically Insulated Ceilings:
a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.
b) Unenclosed Spaces: R-19.
c) Unenclosed Spaces above Offices and Restrooms: R-30.

2) Thermally Insulated Ceilings / Roof:
a) R-38 Standard: All Other. (R-49 in Climate Zones 6, 7, and 8).
3) Wood Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-25	7-1/4 inches deep	184 mm deep
R-30	9-1/4 inches deep	235 mm deep
R-38	11-1/4 inches deep	286 mm deep

4) Metal Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-13	3-5/8 inches deep	92 mm deep
R-15	4 inches deep	102 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-22	6 inches deep	152 mm deep
R-25	7-1/4 inches deep	184 mm deep
R-25	8 inches deep	191 mm deep
R-30	9-1/4 inches deep	235 mm deep
R-30	10 inches deep	254 mm deep
R-38	11-1/2 inches deep	292 mm deep
R-38	12 inches deep	305 mm deep

2.2 ACCESSORIES SYSTEMS

A. Attic Baffles:
1. Design Criteria:
a. Baffle can be used with spray foam, loose-fill, fiberglass, or other insulation materials.
2. Acceptable Manufacturers:
a. SB24 SmartBaffle by DCI Products, Inc., Clifton Heights, PA www.dciproducts.com.
b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Leave no gaps in insulation envelope.

2. If two layers of insulation are used to attain required 'R' value, only layer towards interior of building shall have facing.
3. Provide minimum clearance around recessed lighting fixtures as approved by local code.

B. In Framing:
1. Install insulation behind plumbing and wiring, around duct and vent line penetrations, and in similar places.
2. Fit ends of batts snug against top and bottom plates.
3. Fit batts snug against stud framing at each side.
4. Where insulation is not enclosed by structure or drywall, support in place with wire or other suitable material as approved by Architect before bid.

C. Attic Baffles:
1. Install in accordance with manufacturer's instructions.
2. instructions.
3. Install baffles between trusses or rafters and underside of roof sheathing as shown on Contract Drawings.
4. Install baffles to prevent insulation from blocking ventilation airflow from soffit.

END OF SECTION

SECTION 07 2616

BELOW-GRADE VAPOR RETARDER

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Vapor retarder, seam tape, and penetration accessories for installation under interior slabs-on-grade.

B. Related Requirements:
   1. Section 31 1123: 'Aggregate Base' for installation of vapor retarder over aggregate base under concrete slab.

1.2 REFERENCE

A. Association Publications:
   1. American Concrete Institute:
      a. ACI 302.1R-15, 'Guide for Concrete Floor and Slab Construction'.
         1) Section 3.2.3, ‘Vapor Retarder’.
      b. ACI 302.2R-06, ‘Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials'.

B. Definitions:
   1. Vapor Barrier: Material that has permeance of 0.1 perm or less. Vapor barrier is a material that is essentially vapor impermeable. Vapor barrier is a Class I vapor control layer. Test procedure for classifying vapor retarders is ASTM E96 Test Method A—the desiccant or dry cup method.
   2. Vapor Retarder: Vapor retarder is a material that has permeance of 1.0 perm or less and greater than 0.1 perm. Vapor retarder is a material that is vapor semi-impermeable. Vapor retarder is a Class II vapor control layer. The test procedure for classifying vapor retarders is ASTM E96 Test Method A—the desiccant or dry cup method.
   3. Vapor Retarder Classes and Permeance Descriptions:
      a. Classes of Vapor Retarders:
         1) Class I Vapor Retarder: 0.1 perm or less.
         2) Class II Vapor Retarder: 1.0 perm or less and greater than 0.1 perm.
         3) Class III Vapor Retarder: 10 perm or less and greater than 1.0 perm.
      b. Four general classes based on permeance):
         1) Vapor Impermeable: 0.1 perm or less.
         2) Vapor semi-impermeable: 1.0 perm or less and greater than 0.1 perm.
         3) Vapor semi-permeable: 10 perm or less and greater than 1.0 perm.
         4) Vapor permeable: greater than 10 perms.

C. Reference Standards:
   1. ASTM International:
      a. ASTM D1709-16a, ‘Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method’.
      b. ASTM E96/E96M-16, ‘Standard Test Methods for Water Vapor Transmission of Materials'.
      c. ASTM E1745-17, ‘Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's literature or cut-sheets.
   2. Samples:
      a. Vapor Retarder:
         1) Submit sample of specified vapor retarder.

B. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Independent laboratory test results showing compliance with ASTM C1745 Standard.
   2. Source Quality Control Submittals:
      a. Vapor Retarder:
         1) Installation, seaming, and penetration boot instructions.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final, executed copy of Warranty:
      b. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's documentation showing compliance to Contract Documents.

1.4 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer standard warranty to be free of defects and installed without damage.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Manufacturer Contact List:
      a. Fortifiber, Reno, NV www.fortifiber.com.
      b. Insulation Solutions, East Peoria, IL www.insulationsolutions.com.
      c. Inteplast Group, Livingston NJ www.BarrierBac.com.
      d. Raven Industries, Sioux Falls, SD www.ravenind.com.
      e. Reef Industries, Houston, TX www.reefindustries.com.
      f. Stego Industries, San Juan Capistrano, CA www.stegoindustries.com.
      g. W R Meadows, Hampshire, IL www.wrmeadows.com.

B. Materials:
   1. Vapor Retarder:
      a. Design Criteria:
         1) Meet requirements of ASTM E1745, Class A rating.
         2) Thickness: 15 mil (0.38 mm) minimum.
         3) Physical Properties:
            a) Water Vapor Pemeance ASTM E96, Method A Perm 0.01
            b) Puncture Resistance ASTM D1709.
      b. Approved Products. See Section 01 6200.
         1) Barrier-Bac VB-350 (16 mil) by Inteplast Group.
         2) Griffolyn 15 by Reef Industries.
         3) Moistop Ultra 15 Underslab Vapor Retarder by Fortifiber.
         4) Perminator (15 mil) by W R Meadows.

5) Stego Wrap by Stego.
6) Vapor Block 15 by Raven Industries.
7) Viper Vaporcheck II (15 mil) by Insulation Solutions.

2.2 ACCESSORIES

A. Vapor Barrier:
   1. Seam Tape: As recommended by Membrane Manufacturer for continuous taping of seams and sealing of penetration boots.
   2. Penetration Boots at Utility Penetrations:
      a. Quality Standard: Factory fabricated pipeboots:
         1) Moistop: The Boot.
         2) Raven: VaporBoot.
         3) Reef Industries: VaporBoot.
         4) All Others:
            a) Other Manufacturer's boot system.
            b) or
            c) Field fabricated from same material as vapor retarder membrane.

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 07 2719

PLASTIC SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install air infiltration barriers on exterior side of exterior wall sheathing.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM E1677-11, 'Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Test And Evaluation Reports: Copy of test results showing performance characteristics.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final, executed copy of Warranty (if available from Manufacturer).

1.4 QUALITY ASSURANCE

A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
   1. Manufacturer Qualifications:
      a. Provide single source for all products of system.

1.5 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's limited warranty (if available on product).

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Approved Products. See Section 01 6200.
      a. Styrofoam Weathermate Plus by Dow, Chemical Co, Midland, MI www.dow.com
      b. Tyvek HomeWrap by Du Pont Company, Wilmington, DE www.dupont.com
      c. DriShield Housewrap by Protecto Wrap, Denver, CO www.protectowrap.com
      d. Fortress Pro by Raven Industries, Sioux Falls, SD www.ravenind.com
      e. Typar Housewrap by Fiberweb, Old Hickory, TN www.typar.com.

B. Materials:
   1. Air Retarder:
      a. Non-woven.
      b. Meet requirements of ASTM E1677, Type I.
   2. Sealing Tape:
      a. Acceptable Products:
         1) DuPont Contractor Tape.
         2) Fortress Pro Seaming Tape.
         3) Typar Construction Tape.
         4) 3M Contractor Sheathing Tape.
         5) Protecto Wrap BT25 XL Window Sealing Tape.
         6) As recommended in writing by Air Retarder Manufacturer.
   3. Fasteners:
      a. Approved Products. See Section 01 6200.
         1) Metal Framing: Corrosion resistant, self-tapping screws and plastic washers or Tyvek Wrap Caps. Screws to be 3/4 inch (19 mm) long minimum and washers one inch (25 mm) diameter.
         2) Wood Framing: Corrosion resistant roofing nails with 3/4 inch (19 mm) long shank minimum and one inch (25 mm) diameter plastic head or Tyvek Wrap Caps. Staples are only allowed to aid in installation with permanent fasteners installed immediately thereafter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install over exterior wall sheathing.
   1. Apply specified fasteners along stud lines at 18 inches (450 mm) maximum on center. Lap horizontal joints 6 inches (150 mm) minimum, with upper layer placed over lower layer. Lap vertical seams 16 or 24 inches (400 or 600 mm) as necessary to match framing spacing. Do not fasten at bottom where necessary to allow for installation of flashing behind air infiltration barrier at base of masonry veneer.
   2. Seal joints and penetrations through air infiltration barrier with specified tape before installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures.

END OF SECTION

SECTION 07 4113.16

STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
   1. Meet with Owner, Architect, Metal Panel Installer, Manufacturer Representative, others whose work interfaces with metal panels including roof accessories and roof-mounted equipment.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review structural loading limitations of [deck] [purlins and rafters] during and after roofing.
   6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
   7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   8. Review temporary protection requirements for metal panel systems during and after installation.
   9. Review procedures for repair of metal panels damaged after installation.
   10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Sustainable Design Submittals:
   1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index (SRI) requirements.
   2. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.

C. Manufacturer’s Shop Drawings:
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
   3. Indicate work to be field fabricated or field assembled.

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
   1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than 10 years of documented experience.
   1. Certified ISO 9001:2015 with Design.

B. Installer Qualifications: Company with at least three years of documented experience.
   1. MCA Roof Installation Certificate of Completion.

C. Source Limitations: Obtain all components for roofing system from or approved by roofing system manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels on Project site as recommended by manufacturer to minimize damage, ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels and trims during installation for removal immediately after installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Product Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: [Two] <Insert number> years from date of Substantial Completion.

B. Finish Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 30 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
   1. Single-source warranty protection.
   2. All trims, accessories, and underlayment's included.
   3. Full coverage for materials and labor associated with roof installation.
   4. Periodic evaluations and final roof evaluation written report by manufacturer-authorized third-party roof inspector.
   5. Warranty Period: [20] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than <Insert number> percent.

B. Solar Reflectance Index (SRI): Not less than [78] [29] when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

C. Solar Reflectance Index (SRI): Three-year-aged SRI not less than [64] [32] or initial SRI not less than [82] [39] when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

D. Solar Reflectance Index (SRI): Not less than [78] [29] when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

E. Solar Reflectance Index (SRI): Three-year-aged SRI not less than [64] [15] when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

F. "Solar Reflectance Index (SRI)" Paragraph below applies to Green Globes. First option is minimum for roofs with slopes of 2:12 or less; second option is for roofs with slopes steeper than 2:12.Solar Reflectance Index (SRI): Not less than [78] [29] when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

G. Energy Performance: Provide roof panels in accordance with one of the following when tested in accordance with CRRC-1:
   1. Three-year, aged solar reflectance of not less than [0.55] <Insert value> and emissivity of not less than [0.75] <Insert value>.
   2. Three-year, aged Solar Reflectance Index (SRI) of not less than [64] <Insert value> when calculated in accordance with ASTM E1980.

H. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E1592:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: [As indicated on Drawings] <Insert loads>.
   3. Deflection Limits: For wind loads, no greater than [1/180] [1/240] <Insert deflection> of the span.

I. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested in accordance with ASTM E1680[or ASTM E283] at the following test-pressure difference:
   1. Test-Pressure Difference: [1.57 lbf/sq. ft. (75 Pa)] [6.24 lbf/sq. ft. (300 Pa)].

J. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E1646[or ASTM E331] at the following test-pressure difference:
   1. Test-Pressure Difference: [2.86 lbf/sq. ft. (137 Pa)] [6.24 lbf/sq. ft. (300 Pa)].

K. Comply with ANSI/MCA FTS-1-2019, "Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems."

L. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating UL 580 and [UL 30] [UL 60] [UL 90] verify the designation as Class vs. UL or with supplemental testing of UL 1897 to failure beyond UL 580 Class 90 designation.

M. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): [120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces] <Insert temperature range>.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
   2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels (**MRD150**): Formed with vertical ribs at panel edges and [intermediate stiffening ribs symmetrically spaced] [a flat pan] between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International, Inc.; **Dutch Seam MRD** or comparable product by one of the following:

a. CENTRIA Architectural Systems.
b. IMETCO.
c. ATAS INTERNATIONAL, INC.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
   a. Nominal Thickness: [0.023 inch (0.56 mm)] [0.03 inch (0.71 mm)].
   b. Exterior Finish: [Two-coat fluoropolymer] [Three-coat fluoropolymer] [Mica fluoropolymer] [Custom metallic fluoropolymer] [Custom FEVE fluoropolymer] [Mill finish acrylic-coated galvalume] <Insert finish>.
   c. Color: [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range] <Insert color>.

3. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   a. Thickness: [0.032 inch (0.81 mm)] [0.040 inch (1.02 mm)].
   b. Surface: [Smooth, flat] [Embossed] finish.
   c. Exterior Finish: [Two-coat fluoropolymer] [Three-coat fluoropolymer] [Mica fluoropolymer] [Custom metallic fluoropolymer] [Custom FEVE fluoropolymer] [Clear anodized] [Bronze Anodized] <Insert finish>.
   d. Color: [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range] <Insert color>.

4. Clips: One-piece fixed to accommodate thermal movement.

   a. Material: [**0.028-inch- (0.71-mm-)**] [**0.064-inch- (1.63-mm-)**] nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
   b. Material: [0.0250-inch- (0.635-mm-)] [0.0625-inch- (1.587-mm-)] thick, stainless steel sheet.

5. Panel Coverage:
   a. Dutch Seam MRD:
      1) Seam Height: 1.5 inches (38 mm).
      2) Panel Width: 15 inches (381 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (minus 29 deg C); ASTM D1970.
   3. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International, Inc.; ATA-Shield Underlayment or comparable product by one of the following:
      a. GCP Applied Technologies Inc., Grace Ultra.
      b. Owens Corning; Titanium PSU30 Roof Underlayment.

B. Mechanically Fastened Roofing Underlayment: Provide mechanically fastened roofing underlayment without sealed seams; woven polypropylene with anti-slip polyolefin coating on both sides, minimum thickness 30 mils (.76 mm); meeting or exceeding requirements of ASTM D226/D226M.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International, Inc.; ATA-Guard Underlayment or comparable product by one of the following:
      a. GCP Applied Technologies, Inc., Tri-Flex XT Synthetic Underlayment.
      b. Owens Corning, Titanium UDL50.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide factory-formed components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels. Provide prefabricated, pre-notched, close-fitting components of aluminum in the same color and finish as the roofing panel.
   2. Above Sheathing Ventilation (ASV) Spacer Shims: Polyoxymethylene (engineered thermoplastic) 3/8 inch (9.5 mm) stackable shims.
   3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips, cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide factory-formed flashing and trim formed from same material as metal panels, 144 inches (3658 mm) minimum, as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from aluminum, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 144-inch (3658-mm) long sections, of size and metal thickness in accordance with SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from aluminum of the same color and finish as roof panels. Fabricate in 144-inch (3658-mm) long sections, complete with formed elbows and offsets, of size and metal thickness in accordance with SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as roof panels, [0.048-inch (1.2-mm)] <Insert dimension> nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
   1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

G. Panel Fasteners:
   1. Fasteners: Manufacturer's standard type.
      a. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
      b. Metal-to-Wood Fasteners: Self-tapping wood screws.
      c. Carbon steel thread with organic long-life coating
      d. Exposed Fasteners: Type 304 stainless steel cap head.
   2. Encapsulated EPDM Washer: Baked-on, high-performance-compatible, chip-resistant finish to match panel color.

H. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Exposed Sealant: High-performance elastomeric, clear tri-polymer sealant, as recommended by manufacturer.

2. Spacer Cubes: High-performance spacer cubes to prevent bottoming out of sealant when fasteners are installed non-curing butyl tape.
3. Seam Sealant: Factory-applied high-performance, high-solid, non-skinning, non-drying seam sealant formulated for roll-forming application into concealed panel joints.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Factory-fabricate flashing and trim to comply with manufacturer's written instructions and ANSI/MCA FTS-1-2019, "Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

D. No exposed cut edges on seams or panels.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Wet Chemistry Cleaning and Pretreatment:
1. Use complex chrome-oxide pretreatment.
2. Use chrome final rinse.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel Panels and Accessories:
1. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
2. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
3. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].

4. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
5. Two-coat fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether (FEVE) resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
6. Concealed Finish: Apply manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

E. Aluminum Panels and Accessories:
1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
2. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
3. Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
4. Custom Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
5. Custom FEVE Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether (FEVE) resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
6. Exposed Anodized Finish:

    a. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm] [AA-M12C22A31, Class II, 0.010 mm] or thicker.
    b. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.

F. Stainless Steel Panels and Accessories:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: ASTM A480/A480M No. 4.

3. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

G. Copper Panels and Accessories:
1. Prepatination: Factory prepatinate in accordance with ASTM B882 to convert the copper surface to an inorganic crystalline structure with the appearance and durability of naturally formed patina.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
   2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated [below] [on Drawings], wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm).[Extend underlayment into gutter trough.] Roll laps with roller. Cover underlayment within 14 days.
   1. Apply over the entire roof surface.
   2. Apply over the roof area indicated below:

      a. Roof perimeter for a distance up from eaves of [24 inches (610 mm)] [36 inches (914 mm)] <Insert dimension> beyond interior wall line.
      b. Valleys, from lowest point to highest point, for a distance on each side of [18 inches (460 mm)] <Insert dimension>. Overlap ends of sheets not less than 6 inches (152 mm).
      c. Rake edges for a distance of [18 inches (460 mm)] <Insert dimension>.
      d. Hips and ridges for a distance on each side of [12 inches (305 mm)] <Insert dimension>.
      e. Roof-to-wall intersections for a distance from wall of [18 inches (460 mm)] <Insert dimension>.
      f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of [18 inches (460 mm)] <Insert dimension>.

3.4 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

A. Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Remove protective film from surface of roof panels and trims immediately prior to installation.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
9. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
4. Stainless Steel Panels: Use stainless steel fasteners.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners in accordance with manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:

a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommended in writing by manufacturer as needed to make panels watertight.
b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Clipless Metal Panel Installation: Fasten metal panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions. Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 12 ft. (3.66 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

I. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

J. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) O.C. in between.
1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

K. Roof Curbs: Install flashing around bases where they meet metal roof panels.

L. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 07 4113.16

METAL CLADDING PLANKS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 05 40 00 – Cold-Formed Metal framing: Metal framing for support of aluminum soffits.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method (NRC)
2. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
3. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
4. ASTM E283-04 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
5. ASTM E331-00 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
6. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers (LRV)
7. ASTM E2768-11 – Standard Test Method for Extended Duration Surface Burning Characteristics for Building Materials (30 min Tunnel Test). Results: Zero Flame Spread, Smoke Developed Index of 5. Meets criteria for Class A fire rating

B. UL & Underwriters Laboratories (UL)
1. UL 723, Standard Method of Test for Surface Burning Characteristics of Building Materials

C. American Architectural Manufacturers Association (AAMA)
1. AAMA 2605 - Voluntary Specification, Performance requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
2. AAMA 2604 - Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels
3. AAMA 509 - Voluntary Test and Classification Method for Drained and Back Ventilated Rainscreen Wall Cladding Systems
4. AAMA 501.1-17 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

D. International Code Council Evaluation Service (ICC-ES)
1. ICC-ES Evaluation Report

1.3 SUNMITTALS

A. Product data: submit manufacturer's printed product literature, specifications and data sheet.

B. Submit duplicate 6 inch X 6 inch (152mm x 150mm) samples of cladding material, of color and profile specified.

C. Shop drawings to indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.4 WARRANTY

A. Provide a written guarantee, signed and issued in the name of the owner, covering the metal cladding/cladding material for 15 (fifteen) years from the date of Substantial Completion.

B. The manufacturer's warranty is limited to replacement of defective material only, rather than installation of the same. Faulty installation shall be corrected by the installing contractor. The warranty required herein is the sole remedy against the manufacturer and there are no other implied warranties. In any event, the manufacturer shall not be liable for incidentals or consequential damages.

PART 2 - PRODUCTS

2.1 ALUMINUM CLADDING AND COMPONENTS

A. 6-inch (152mm) V-Groove planks extruded aluminum 6063 T5
   1. Finish coating: powder coated finish
   2. Color: color selected by Owner’s Representative.
   3. Gloss: 30 ± 5.
   4. Thickness: 1/16 inch (1.57mm) base metal thickness.
   5. Profile: 6-inch (152mm) V-Groove X 24 ft (7315.2mm) plank

2.2 ACCESSORIES

A. 3" starter strip, 5/8" starter j-track, 5/8" j-track, 5/8" two piece j-track, 1-3/8" two piece j-track, 3/4" inside corner, 1" outside corner, 2" corner set, 3/16" outside corner, 5/8" termination set, 1-3/8" termination set, 1-3/8" compression joint, 1/2" flat reveal, 3/4" u-reveal set, 1-1/2" u-reveal set, 1-1/2" flat reveal set, 3/4" T&G u-reveal, 1-1/2" T&G u-reveal, 1/2" T&G flat reveal, 2” offset flat reveal, in same material and finishes as cladding.

B. Plank Clips: 316 Stainless steel Quick-Screen Clips that are shipped loose for field installation.

2.3 MANUFACTURERS

A. Longboard Architectural Products #120 - 1777 Clearbrook Rd.
Abbotsford, BC, Canada V2T 5X5
info@longboardproducts.com
1.800.604.0343 – www.longboardproducts.com

PART 3 - EXECUTION

3.1 ORDERING, DELIVERY, STORAGE AND HANDLING

A. Ordering: Conform to manufacturer’s ordering instructions and lead time requirements to avoid construction delays

B. Deliver materials and components in manufacturers' unopened containers or bundles. Prevent damage during unloading, storing and installation

C. Store, protect and handle materials and components in accordance with manufacturer's recommendations to prevent twisting, bending, mechanical damage, contamination and deterioration

D. Stack metal cladding horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal cladding to ensure dryness, with positive slope for drainage of water. Do not store metal cladding in contact with other materials that might cause staining, denting, or other surface damage

E. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION

A. Install cladding and components in accordance with manufacturer's written instructions and shop drawings, including product technical bulletins, datasheets and install videos

B. Install all cladding planks using Quick-Screen Clips in accordance with the manufacturer's written instructions, technical bulletins, datasheets and install videos to not restrict thermal movement at specified o.c. spacings. Install screws in pre-punched holes. Install one (1) hard-fastened screw per plank, directly through the plank flange to prevent plank migration. All fasteners should penetrate into solid, secure framing or blocking

C. Install components in accordance with the manufacturer's written instructions and shop drawings, including technical bulletins, datasheets and install videos with positive anchorage to building and provide for thermal movement

D. Install screw fasteners using power tools having controlled torque adjusted to compress Quick-Screen Clips tight without damage or deformation of the Quick-Screen Clips, screw heads, screw threads or cladding

E. Hard-fasten any and all butt-joints into solid secure framing or blocking, to maintain tight fitting hairline joints. Never exceed one (1) hard-fastener per plank, all other attachment points to use Quick-Screen Clips to not restrict thermal movement

F. Do not install damaged panels; repair or replace as required

3.3 CLEANING

A. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 07 46 16

SECTION 07 5419

POLYVINYL-CHLORIDE ROOFING: PVC

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install roofing membrane with flashings and other components to comprise total roofing system as described in Contract Documents including:
      a. Single-ply membrane.

B. Related Requirements:
   1. Section 07 6220: 'Stainless Steel Flashing And Trim' for metal work installation and requirements.

C. Products Installed But Not Furnished Under This Section:
   1. Sheet metal work including flashing, parapet caps, sleeves, pipe enclosures boxes, strapping, and scuppers.

D. Related Requirements:
   1. Division 07 for sheet metal work specialties and accessories.

1.2 REFERENCES

A. Association Publications:
   1. American National Standards Institute / Single Ply Roofing Industry:
      a. ANSI/SPRI/FM 4435/ES-1 2003, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
      b. ANSI/SPRI WD-1 'Wind Design Standard for Roofing Assemblies'.
   2. FM Global Resource Catalogue by FM Global, Norwood, MA www.fmglobal.com.
      a. Approval Guide:
         1) Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
      b. Property Loss Prevention Data Sheet 1-28, ‘Wind Design’ (latest edition).
      c. Property Loss Prevention Data Sheet 1-29, ‘Roof Deck Securement and Above-Deck Components’ (latest edition).
      d. Property Loss Prevention Data Sheet 1-49, ‘Perimeter Flashing’ (latest edition).

B. Definitions:
   1. Flame Spread Classification: Categories as per ASTM E84/UL 723 or ULC 102:
      a. Class A: Highest fire-resistance rating for roofing as per ASTM E108. Indicated roofing is able to withstand severe exposure to fire exposure to fire originating from sources outside building.
      b. Class B: Fire-resistance rating indicating roofing materials are able to withstand moderate exposure to fire originating from sources outside of building.
      c. Class C: Fire-resistance rating indicating roofing materials are able to withstand light exposure to fire originating from sources outside of building.

C. Reference Standards:
   1. ASTM International:
      a. ASTM C1289-18a, ‘Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.
      b. ASTM C1303/C1303M-15, ‘Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation’.
   2. Underwriters Laboratories (UL):
      a. UL 580: 'Tests for Uplift Resistance of Roof Assemblies' (5th Edition).

b. UL 723, 'Tests for Safety Test for Surface Burning Characteristics of Building Materials' (11th Edition).
c. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
d. UL 2218, 'Standard for Impact Resistance of Prepared Roof Coverings Materials' (2nd Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
1. Participate in MANDATORY pre-installation conference.
a. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Roofing Manufacturer's Representative if available.
2. Schedule pre-installation conference at project site after installation of roof deck including pipe and flue penetrations, but before application of any roofing system component.
3. In addition to agenda items specified in Section 01 3100, review following:
a. Review Manufacturer's written instructions.
b. Review if Project is in high wind area.
c. Review delivery, storage, and handling requirements.
d. Review ambient conditions requirements.
e. Review roofing installation requirements including flashing and penetrations.
f. Review membrane safety stripe required to be located around perimeter of roof.
g. Review roofing drainage requirements.
h. Review temporary protections for roofing system.
i. Review cleaning and disposal requirements.
j. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
k. Review safety issues.
l. Review field inspections and non-conforming work requirements.
m. Review protection of membrane by other trades after installation of membrane.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
a. Manufacturer's literature or cut sheet for each element of system.
b. Manufacturer's preparation and installation instructions and recommendations.
2. Shop Drawings:
a. Prepared by Roofing Installer and approved by Roofing Membrane Manufacturer and include following:
1) Base flashings.
2) Location and type of penetrations.
3) Membrane terminations.
4) Outline of roof and roof size.
5) Perimeter and penetration details.
6) Roof insulation:
a) Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
b) Taper insulation, including slopes.
7) Special details and materials.
b. Confirm that specified FM Class and UL Class assembly is appropriate for Project location.
c. Include approved copy of Manufacturer's Notice of Award or Assembly Letter.
3. Samples:
a. Manufacturer's 4 inch (100 mm) square minimum sample representing actual color, membrane and thickness.

B. Informational Submittals:
1. Certificates:
a. Installer's signed certificate stating roofing system complies with Contract Documents performance requirements and work only performed by trained and authorized personnel in those procedures.

b. Manufactures signed certificate that roof system has been inspected by Technical Service Representative and stating no deviation from system specified or approved shop drawings without written approval by Owner Representative and Manufacture.

2. Test And Evaluation Reports: Submit evidence that roof system has been tested and approved or listed as follows:
   a. Submit evidence that roof system has been tested and approved or listed to meet Factory Mutual Research Corporation (FM) Classification required for this Project.
   b. Submit evidence that roof system has been tested to meet UL Class requirement required for fire-resistance rating for this Project.
3. Manufacturer Instructions:
   a. Two (2) copies of Roofing Manufacturer's published instructions for Architect and maintain one (1) at job-site.
4. Special Procedure Submittals:
   a. Installer to fill out 'Roof Manufacturer' Installer Workmanship Warranty' and 'Manufacturer System Warranty' from information provided in the Attachment 'Roofing Manufacturer's Information For Architect' from Manufacturer and from Architect. Warranties are to be included in Closeout Submittals.
5. Qualification Statement:
   a. Roofing Manufacturer's certification of Installer.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual:
   a. Warranty Documentation:
      1) Final, executed copy of ‘Roofing Manufacturer System Warranty’ including wind speed coverage and required Owner mandatory information.
      2) Final, executed copy of ‘Roof Installer Workmanship Warranty’ including required Owner mandatory information.
      3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
   b. Record Documentation:
      1) Manufacturers Documentation:
         a) Record Shop Drawings if requested. Record shop drawings shall be given shop drawing number by Roofing Manufacturer.
         b) Certificate: Manufacturer Inspection report by Technical Service Representative.
         c) Certificate: Installer statement of compliance for performance requirements.
         d) Test And Evaluation Report: UL fire-resistance rating test report.
         e) Test And Evaluation Report: Factory Mutual Research Classification approval.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Requirements:
1. Roof system will meet requirements of all federal, state, and local codes having jurisdiction (AHJ).
2. Fire Characteristics Performance Requirement:
   a. Roof system will achieve UL Class A rating when tested in accordance with ASTM E108 or UL 790:
      1) Materials shall be identified with appropriate markings of applicable testing agency.

B. Qualifications:
1. Requirements of Section 01 4301 applies but not limited to the following:
   a. Installers Qualifications:
      1) Provide documentation if requested by Architect:
         a) Roofing Installer shall be approved and authorized by Roofing System Manufacturer to install Manufacturer’s product and eligible to receive Manufacturer’s special warranty before bid.
         b) Roofing Installer shall be able to document roofing membrane installation for five (5) year minimum.
         c) Roofing Installer must have current license for the city, county, and state where project is located.
         d) Roofing Installer must have license for specific type of roofing work to be preformed.

e) Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
f) Membrane and flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
g) Welding equipment shall be provided by or approved by Roofing Manufacturer. Mechanics intending to use equipment shall have successfully completed training course provided by Manufacturer's Technical Representative before welding.

b. Manufacturer Qualifications:
1) Manufacturer shall manufacture membrane material for five (5) consecutive years.
a) No product with documented failure will be allowed.
2) Manufacturer that is UL listed for membrane roofing system used for this Project.
3) Source Limitations:
a) Provide roof components including roof insulation and fasteners for roofing system from same Manufacturer as membrane roofing or approved by Roofing Membrane Manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.
2. Deliver products job site in original unopened containers or wrappings bearing all seals and approvals.
3. Deliver materials in sufficient quantities to allow continuity of work.
4. Remove any material not approved from job site.

B. Storage And Handling Requirements:
1. General:
a. Follow Manufacturer's instructions and precautions for storage of materials.
b. Handle and store roofing materials and place equipment in manner to avoid permanent deflection of roof decking.
c. Material Safety Data Sheets (MSDS) must be on location always during transportation, storage and application of materials.
2. Storage Requirements:
a. Protection:
1) Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location and with temperature range required by Manufacturer. Protect from direct sunlight.
2) Provide continuous protection of materials against moisture absorption (Manufacturer's/Supplier's shrink wrap is not accepted waterproofing).
3) Store membrane rolls lying down on pallets fully protected from weather with clean canvas tarpaulins.
b. Roof Insulation:
1) Comply with insulation Manufacturer's written instructions for handling, storing, and protection during installation.
c. Safety:
1) Store flammable materials in cool, dry area away from sparks, open flames, or excessive heat. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
2) Liquid materials such as solvents and adhesives shall be stored off site and installed away from open flames, sparks, and excessive heat.
3) Site storage is acceptable if liquid materials are placed in a locked, sealed storage container.
4) Situate equipment and materials so as to preclude danger, disturbance, or interference to public safety and traffic, and to not constitute fire hazard.
d. Temperature:
1) Store adhesives at temperatures above 40 deg F (4 deg C).and below 180 deg F (82 deg C).
e. Unacceptable Material:
1) Remove from job site materials that are determined to be damaged by Architect or by Roofing Manufacturer and replace at no additional cost to Owner.

2) Remove all wet and damaged materials from site.
3) Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

3. Handling Requirements:
   a. Select and Handle operating equipment so as not to damage existing construction or new roofing system, or to overload structural system.
   b. Handle rolled goods so as to prevent damage to edge or ends.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
1. Temperature ranges shall be within tolerances allowed for material being used.
   a. Roof surface shall be free of ponding water, ice, and snow.
   b. Cold temperature:
      1) Follow Manufacturer's written instructions for cold temperature requirements before applying membrane adhesive:
         a) Follow specified precautions.
         b) Expose only enough adhesive to be used as directed by membrane manufacturer:
         c) Low VOC restrictions (if required by local AHJ): Temperatures to be 40 deg F (4 deg C) and rising before applying.
   c. Hot temperature:
      1) Do not expose membrane and accessories to constant temperature in excess of 180 deg F (82 deg C).
2. Proceed with roofing work when existing and forecasted weather conditions permit.

1.8 WARRANTY

A. Manufacturer Warranty:
1. Roofing Membrane Manufacturer's Special Warranty for:
   a. Thirty (30) year no dollar limit (NDL) material and labor warranty covering roofing system, including insulation, components of membrane roofing system and flashing degradation and workmanship.
   b. Accidental Puncture Warranty:
      1) Membrane Manufacturer's written Accidental Puncture Warranty for up to sixteen (16) hours of Labor to repair punctures after final inspection.

B. Roof Installer Workmanship Warranty:
1. Written five (5) year guarantee covering workmanship and repairs or replacement of work without cost to Owner, counter-signed by Installer and General Contractor from date of installation:
   a. Roof Installer Workmanship Warranty must include information required in Attachment 'Warranty Information'.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturer:
1. Category Three Approved Manufacturers. See Section 01 6200 for definitions of Categories:
   a. Sika Sarnafil, Canton, MA (800) 576-2358 or (781) 828-5400. www.sikacorp.com.
      1) Contact Information (USA, Canada and Global):
         a) Primary Contact: Steve Moosman, District Manager, office (801) 575-8648 x7551 cell (801) 201-6269 moosman.steve@us.sika.com.
         b) Secondary Contact: Jim Greenwell, Mountain Region Manager: office (801) 575-8648 x7558 cell (801) 455-3838 greenwell.jim@us.sika.com.

B. Design Criteria:
1. General:

a. Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
b. Membrane roofing and base flashings shall remain watertight.

2. Drainage Requirement:
   a. Roof system to provide positive drainage where all standing water dissipates within forty eight (48) hours after precipitation ends.
3. Material Compatibility:
   a. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane Roofing Membrane Manufacturer based on testing and field experience.
4. Metal details, fabrication practices, and installation methods shall conform to applicable requirements of following:
   a. Factory Mutual Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest issue).
   b. Sheet Metal and Air Conditioning Contractors National Association Inc, 5th edition.

C. Components:
1. Membrane:
   a. Description:
      1) 'Mechanically Attached':
         a) Meet requirements of ASTM D4434/D4434M, Type III:
         b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
            (1) Sika Sarnafil: S327 polyester reinforced membrane:
               (a) Rhinobond attached system.
      2) 'Adhered':
         a) Meet requirements of ASTM D4434/D4434M, Type III.
         b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
            (1) Sika Sarnafil:
               (a) G410 fiberglass reinforced membrane with lacquer coating.
   b. Thickness:
      1) Field membrane: Thickness: 80 mil (2.03 mm) by optimum width and length determined by job conditions.
      2) Flashing membrane: Thickness: 0.60 mil (1.52 mm) by optimum width and length determined by job conditions.
   c. Safety Stripe:
      1) Provide continuous 4 inch (100 mm) wide yellow membrane safety stripe.
   d. Surface Color:
      1) Grey.
      2) Tan.
      3) White.
2. Insulation:
   a. FM and UL approved.
   b. If required by Manufacturer for warranty, provide approved facer.
   c. Polyisocyanurate Foam Insulation Board:
      1) Meet requirements of ASTM C1289.
      2) Insulation boards shall be Factory Mutual approved for classification selected for project.
      3) Facer:
         a) Fiber reinforced paper facer or coated-glass fiber mat facer.
      4) Insulation panels directly under roofing membrane and roof system cover board shall not exceed 48 inches by 96 inches (1 200 mm by 2 400 mm).
      5) Insulation panels to be 2 inches (50 mm) maximum thickness for each layer. Insulation shall be multiple layers and achieve minimum 'R' value of 30. Tapered layer shall slope at 1/4 in per ft (20 mm per meter).

3. Roof System Cover Board (Recovery/Hard Board) Over Insulation:
   a. Non-Fire Rated:
      1) 'Mechanically Attached' application:
         a) Minimum thickness to be determined by roofing system Manufacturer based upon Warranty term and Wind Warranty requirements.

b) Category Four Approved Products.
(1) 1/2 inch (12.7 mm) thick minimum Dens-Deck Prime Roof Board by G-P Gypsum.
(2) 1/2 inch 1/2 inch (12.7 mm) thick minimum Securock by USG.
2) 'Adhered' application:
a) Minimum thickness to be determined by roofing system Manufacturer based upon Warranty term and Wind Warranty requirements.
b) Category Four Approved Products.
(1) 1/2 inch (12.7 mm) thick minimum Dens-Deck Prime Roof Board by G-P Gypsum.
(2) 1/2 inch 1/2 inch (12.7 mm) thick minimum Securock by USG.
b. Fire Rating:
1) Fire Protection Board On Deck:
a) Category Four Approved Products.
(1) 5/8 inch (16 mm) thick minimum Dens-Deck Fireguard Roof Board by G-P Gypsum.
4. Vapor Retarder / Air Barrier:
a. Temporary Roof Membrane (if required to protect interior building):
1) Self Adhered retarder:
2) May be used as temporary roof membrane up to ninety (90) day exposure.
3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
a) Sika Sarnafil:
(1) Sarnavap air and vapor barrier with primers and sealants as required.
b. Steel Roof Deck:
a) Sika Sarnafil:
(1) As recommended by Manufacturer.

2.2 ACCESSORIES

A. Adhesives, Sealants and Sealer:
1. General:
a. Supplied by Roofing Membrane Manufacture Meet uplift and VOC requirements required for Project for specific application method and in compliance with all local codes and restrictions provided by Roofing Membrane Manufacture.
b. As accepted by Roofing Manufacturer under specified warranty.
2. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when required by local codes or AHJ.
3. Pourable Sealer:
a. Approved by Roofing Membrane Manufacturer for specified roof system.
4. Membrane:
a. Category Four Approved Products.
1) Sika Sarnafil:
a) Sarnacol 2170: Solvent based membrane adhesive.
b) Sarnacol 2170 VC: VOC acceptable membrane adhesive.
c) Sarnacol 2121: Water based membrane adhesive.
d) Sarnacol Stabond: VOC acceptable membrane adhesive.
5. Insulation:
a. Category Four Approved Products.
1) Sika Sarnafil:
a) Sarnacol 2163/AD/OM: Low rise polyurethane foam adhesive.

B. Coated Metal:
1. Colors:
a. Not Seen From Ground: Color to match selected roof membrane.
b. Seen From Ground: Manufacturer's standard color as selected by Architect to match membrane surface color chosen for project.
2. Category Four Approved Products.
a. Sika Sarnafil:
1) 25 ga (0.56 mm) G90 galvanized sheet metal laminated with 0.020 inch (0.55 mm) thick membrane:
2) Sarnclad membrane cover strips:

a) 0.060 inch (1.5 mm) thick.
b) Color to match selected Sarnaclad.

C. Counterflashing:
1. Formed to meet design requirements and match existing metals and aesthetics, furnished by Membrane Manufacturer.

D. Mechanical Attachment Accessories:
1. Rhinobond Plates:
a. Category Four Approved Products.
1) Sika Sarnafil:
a) Plates engineered as companion assembly with Sarnafasteners.
b) Used to secure insulation, hardboard, and membrane as required by Membrane Manufacturer.
2. Fasteners:
a. Category Four Approved Products.
1) Sika Sarnafil:
a) Sarnafasteners or engineered fasteners designed to anchor membrane and flashing into substrates that include steel, concrete, gypsum, and light weight concrete roof decks.

3. Bars And Plates:
a. Category Four Approved Products.
1) Sika Sarnafil:
a) Bars and plates engineered as companion assembly with Sarnafasteners. Used to secure membrane and/or flashing as required by Membrane Manufacturer.

E. Miscellaneous Fasteners and Anchors:
1. Fasteners, anchors, nails, straps, bars, etc. shall be of post-galvanized zinc or cadmium-plated steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be in such manner as to avoid galvanic corrosion.
2. Compatible with substrates and flashings to be anchored:
a. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins.
b. Concrete fasteners and anchors shall have minimum embedment of 1-1/4 inch (32 mm) and shall be approved for such use by Fastener Manufacturer.
c. Wood fasteners and anchors shall have embedment of one inch (25 mm) minimum and be approved for such use by Fastener Manufacturer.

F. Prefabricated Flashing Accessories: Membrane corners and pipe stacks as supplied by Membrane manufacturer.

G. Traffic Surface:
1. Standard Walkway:
a. Description:
1) Traffic surface used to protect roof membrane with limited slip surface.
2) Approved for all wind load areas.
3) Heat weldable walk roll.
b. Category Four Approved Products.
1) Sika Sarnafil:
a) SarnaTred Walkway Roll.

H. Wood Nailers:
1. Treat wood nailers as per Section 06 0573.13 for preservative wood treatment. Creosote or asphaltic-treated wood is not acceptable.
2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
3. Wood shall have maximum moisture content of 19 percent by weight on dry weight basis.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Category Three Approved Manufacturer's Roofing Installers:
   1. Sika Sarnafil:

3.2 EXAMINATION

A. Verification Of Conditions:
   1. Examine deck to determine if it is satisfactory for installation of roofing system:
      a. Inspect for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work.
      b. Verify that roof drain lines are functioning correctly before starting work of this Section. Report such blockages in writing to Architect, with copy to Roofing Manufacturer, for corrective action before beginning work of this Section.
      c. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and nailers match thicknesses of insulation to be installed.

   2. Notify Architect of unsuitable conditions in writing:
      a. Commencement of Work by installer is considered acceptance of substrate.
      b. Stop work immediately if any unusual or concealed condition is discovered and immediately notify Architect in writing, with letter copy to Roofing Manufacturer.
      c. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examination And Assessment:
   1. Examine decks for adequacy before commencing work. Requirements shall include but not limited to the following:
      a. Designed slope required for proper drainage.
      b. Location of roof drains.
      c. Moisture conditions that will adversely affect quality of work.
      d. Other condition incompatible with good roofing practice.
   2. Notify Architect in writing of conditions with letter copy to Roofing Membrane Manufacturer that would limit guarantee on part of Manufacturer or applicator.

3.3 PREPARATION

A. Surface Preparation:
   1. General:
      a. Substrate shall be clean, smooth, dry, and free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until defects have been corrected.
      b. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to surfaces exposed during work.
      c. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
      d. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.
      e. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
      f. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
      g. Remove and discard temporary seals before beginning work on adjoining roofing.

B. Wood Nailers:
   1. Install continuous treated wood nailers at perimeter of entire roof and around roof projections and penetrations as described on Contract Drawings by Section 06 1100 'Wood Framing'.

3.4 INSTALLATION

A. Interface With Other Work:
   1. Coordinate with Installers whose work penetrates roof deck or requires men and equipment to traverse roof deck.

B. General:
   1. Installation shall be in conformance with latest edition of manufacturer's specification except where Contract Documents are more restrictive.
   2. Roof surfaces shall be free of water, ice and snow. Surfaces to receive insulation, membrane, or flashings shall be dry. Should surface moisture occur, provide equipment necessary to dry surface before application.
   3. Secure new and temporary construction, including equipment and accessories, so as to preclude wind blow-off and subsequent roof or equipment damage.
   4. Install only as much roofing as can be made weathertight each day, including flashing and detail work. Clean seams and heat-weld before leaving jobsite.
   5. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
   6. Before and during application, remove dirt, debris, and dust from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
   7. Report rooftop contamination that is anticipated or that is occurring to Roofing Manufacturer to determine corrective steps to be taken.

C. Vapor Retarder / Air Barrier Installation:

D. Insulation:
   1. Install insulation as recovery layer over substrate and to obtain desired thermal value. Roof assembly shall be dry.
   2. Neatly cut insulation cut to fit around penetrations and projections.
   3. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
   4. Install tapered insulation around drains creating a drain sump.
   5. Do not install more insulation board than can be covered with roofing membrane by end of day's work or onset of inclement weather.
   6. 'Mechanically Attached' Attachment:
      a. Fasten to deck with approved fasteners and plates in accordance with Insulation Manufacturer, Factory Mutual, and Roofing Manufacturer recommendations for fastening rates and patterns.
      b. Quantity and locations of fasteners and plates shall also result in insulation boards resting evenly on roof deck/substrate so there are no large cavities or air spaces between boards and substrate.
      c. Install fasteners in accordance with fastener manufacturer's recommendations:
         1) Fasteners are to have minimum penetration into structural deck as recommended by Fastener Manufacturer and Roofing Manufacturer.
      d. Rhinobond roof assembly attachment plates and fasteners.
         1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.
   7. 'Adhered' Adhesive Attachment:
      a. All work surfaces should be clean, dry, free of dirt, dust, debris, oils, loose and/or embedded gravel, un-adhered coatings, and other contaminants.
      b. Apply adhesive in thickness and pattern in accordance with Insulation Manufacturer, Factory Mutual, and Roofing Manufacturer recommendations for fastening rates and patterns.
      c. Quantity and location of adhesive beads shall also result in insulation boards resting evenly on roof deck/substrate so there are no cavities between boards and substrate.
      d. Insulation shall be fully bonded to substrate or vapor retarder.

E. Roof System Cover Board:
   1. Offset roof system cover board joints 24 inches (600 mm) minimum from joints in underlying substrate or insulation.
   2. Steel Roof Deck:
      a. Non-visible installation:

1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.

b. Visible (from ground/surrounding buildings) installation.
1) Secure roof system cover board using low profile attachment plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.

c. Rhinobond roof assembly attachment plates and fasteners.
1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.

F. Membrane:
1. Inspection:
a. Inspect surface of insulation or substrate before installation of roof membrane.
b. Substrate shall be clean, dry and smooth with no excessive surface roughness, contaminated surfaces or unsound surfaces such as broken, delaminated, or damaged insulation boards.
c. All sharp projections shall be removed by sweeping, blowing or vacuum cleaning.

2. 'Mechanically Attached':
a. In Seam Option:
1) Unroll and position membrane without stretching. Provide and secure both perimeter and field membrane sheets in accordance with manufacturer's most current specifications and details.
2) Install adjoining membrane sheets in same manner in accordance with manufacturer's specifications.

b. Rhinobond Option:
1) Preparation: Using test strip of membrane and loose Rhinobond plates, provide at least four (4) varied heat settings to calibrate Rhinobond welder for operation during each work period.
2) Roll out and set membrane. Follow Manufacturer's written instructions:
a) Provide 3 inches (75 mm) shingled lap seaming area in all membrane overlaps.
b) Weld random perimeter Rhinobond plates to secure field membrane from shifting during seam and field welds.
c) Identify remaining Rhinobond plates and weld membrane using repeated leap frog method of welding followed by placement of cooling magnets.

3. Adhesive:
a. Follow ambient conditions as specified in Part 1 of this specification.
b. Follow Manufacturer's written application instructions including adhesive coverage rate requirements. Apply no adhesive in seam areas.
1) Installer Option A):
a) Apply adhesive using solvent-resistant nap paint rollers.
2) Installer Option B):
a) Apply adhesive using wet lay-in adhesive application.

4. Hot-Air Welding Of Lap Areas:
a. General:
1) Seams shall be hot air welded. Seam overlaps shall be 3 inches (75 mm) wide minimum when automatic machine welding, and 4 inches (100 mm) wide when hand welding.
2) Membrane to be welded shall be clean and dry. No adhesive shall be in seam.
3) Hand Welding:
a) Hand welded seams shall be completed in three stages. Allow hot-air welding equipment to warm up for one (1) minute minimum before welding.
4) Seam shall be tack-welded every 36 inches (900 mm) to hold membrane in place.
5) Weld back edge of seam with narrow but continuous weld to prevent loss of hot air during final welding.
6) Insert nozzle into seam at 45 degree angle. Once proper welding temperature has been reached and membrane begins to 'flow', position hand roller perpendicular to nozzle and press lightly. For straight seams, use 1-1/2 inch (38 mm) wide nozzle. Use 3/4 inch (19 mm) wide nozzle for corners and compound connections.
b. Machine Welding: Follow Roofing Manufacturer's instructions and use recommended equipment.
c. Quality Control of Welded Seams:

1) Check welded seams for continuity using rounded screwdriver. Make on-site evaluation of welded seams daily at locations directed by Owner's Representative or representative of Roofing Manufacturer.
2) Take one inch (25 mm) wide cross-section samples of welded seams at least three times a day. Patch each test cut at no additional cost to Owner.

d. Safety Stripe:
1) Install continuous yellow membrane safety stripe 6 feet (1.80 m) typical from perimeter edge of roof.

G. Flashings:
1. General:
a. Install flashings concurrently with roof membrane. No temporary flashings will be allowed without prior written approval of Owner's Representative and Roofing Manufacturer. Approval shall only be for specific locations on specific dates.
b. If water is allowed to enter under newly completed roofing, remove and replace affected area no additional cost to Owner.
c. Adhere flashings to compatible, dry, smooth, and solvent-resistant surfaces.
2. Membrane Flashings:
a. Adhesive Application for Flashings:
1) Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.
2) Apply adhesive using solvent-resistant 3/4 inch (19 mm) nap paint rollers. Apply adhesive in smooth, even coatings with no holidays, globs, or similar irregularities. Coat only area that can be completely covered in same day's operations. Allow surface with adhesive coating to dry completely prior to installing flashing membrane.
3) When surface is dry, cut flashing membrane to workable length and evenly coat underside with adhesive apply at Manufacturer's adhesive coverage rate requirements.
4) When adhesive has dried sufficiently to produce strings when touched with a dry finger, roll coated membrane onto previously coated substrate being careful to avoid wrinkles. Do not allow adhesive on underside of membrane to completely dry. Overlap adjacent sheets 3 inches (75 mm). Flashings shall extend 4 inches (100 mm) onto roofing membrane. Press bonded sheet firmly in place with hand roller.
5) Apply no adhesive in seam areas that are to be welded.
b. Install fasteners and membrane fastenings plates at 12 inches (300 mm) on center with acceptable fasteners into structural deck at the base of parapets, walls, and curbs. Also install Sarnastop at the base of tapered edge strips and at transitions, peaks, and valleys according to Roofing Manufacturer's details:
1) Hurricane Bar:
a) Provide inside 4 ft (1.20 m) perimeter peel stop (Hurricane Bar) required by Owner for all projects in all wind speed coverage areas.
c. Extend flashings 8 inches (200 mm) minimum above roofing level unless otherwise accepted in writing by Owner's representative and Roofing Manufacturer.
d. Terminate flashings according to Roofing Manufacturer's recommended details.
e. Mechanically fasten flashing membranes along top edge through tin discs or pre-drilled, galvanized metal strip washers spaced at of 12 inches (300 mm) maximum on center.
f. Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.

3. Metal Flashings:
a. Complete metal work in conjunction with roofing and flashings so that watertight condition exists daily.
b. Install metal to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
c. Metal joints shall be watertight.
d. Securely fasten metal flashings into solid wood blocking. Fasteners shall penetrate wood nailer one inch (25 mm) minimum.
e. Airtight and continuous metal hook strips are required behind metal fascias. Fasten hook strips 12 inches (300 mm) on center into wood nailer or masonry wall.
f. Counterflashings shall overlap base flashings 4 inches (100 mm) minimum.
g. Metal Base Flashings:
1) Space adjacent sheets 1/4 inch (6 mm) apart.

2) Fasten ends of metal 6 inches (150 mm) on center.
3) Cover joint with 2 inch (50 mm) wide aluminum tape.
4) Hot-air weld 4 inch (100 mm) wide strip of flashing membrane over joint.

h. Metal Edge Flashing:
1) Install as per requirements of ANSI/SPRI/FM 4435/ES-1, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
2) Fasten metal edge flashings with two rows of post-galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered.
3) Space adjacent sheets of metal 1/4 inch (6 mm) apart.
4) Cover joint with 2 inch (50 mm) wide aluminum tape.
5) Sika Sarnafil Sarnaclad:
a) Hot-air weld 4 inch (100 mm) wide strip of flashing membrane over joint.

H. Temporary Cut-Off:
1. Construct temporary waterstops to provide one hundred (100) percent watertight seal:
a. Make stagger of insulation joints even by installing partial panels of insulation.
b. Carry new membrane into waterstop.
c. Seal waterstop to deck or substrate so water will not travel under new or existing roofing.
d. Seal edge of membrane in continuous heavy application of sealant as described above.
e. When work resumes, cut-out contaminated membrane and dispose of off-site.
2. If inclement weather occurs while temporary waterstop is in place, provide labor necessary to monitor situation to maintain watertight condition.
3. If water is allowed to enter under newly completed roofing, remove affected area and replace at no additional cost to Owner.

I. Walkway Rolls:
1. Mark lines on membrane to determine location and direction(s) of walkway network. Membrane surface shall be clean.
2. Follow Manufacturer's written application instructions including adhesive coverage rate requirements.

3.5 FIELD QUALITY CONTROL

A. Field Inspection:
1. Before Manufacturer's inspection for warranty, Installer must perform pre-inspection to review work and to verify flashing has been completed as well as application of caulking.
2. Final Roof Inspection:
a. Arrange for Roofing Membrane Manufacturer's technical personnel to inspect roofing installation on completion.
3. Upon completion of roof inspection, provide certification that installation has been performed in accordance with Contract Document and Roofing Manufacturer requirements.

B. Non-Conforming Work:
1. Correct all work not in compliance to Contract Documents at no additional cost to Owner.
a. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
b. Replace contaminated membrane.
2. Additional inspections will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to Owner.
3. Repair landscaped areas damaged by construction activities at no additional cost to Owner.

3.6 CLEANING

A. Waste Management:
1. Perform daily clean-up to collect wrappings, empty container, paper, and other roofing waste debris from project site.
2. Upon completion, roofing waste materials must be disposed from site to dumping area legally authorized to receive such materials.
3. Complete site cleanup, including both interior and exterior building areas that have been affected by construction, to Owner's satisfaction.

3.7 PROTECTION

A. General Contractor Responsibility:
   1. Protection of roofing membrane from damage and wear from other trades from damage after completion of roof membrane.
   2. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction.

END OF SECTION

ATTACHMENTS

PROJECT INFORMATION for ROOF WARRANTY
Provide following information to Roof Installer after BID to be included in 'Roof Installer Workmanship Warranty' and 'Manufacturer System Warranty' as part of the Closeout Submittal.
Name of Owner (FM Group): _____ Mailing Address (FM Office Address) _____ Property ID (Property No.) _____ Site Address (Project Site Address) _____ Roof Completion Date (Substantial Completion date available after BID to be included in Roof Warranty)

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, diverters, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

1.02 DEFINITIONS

A. Base Flashing: That portion of flashing attached to or resting on roof deck to direct flow of water onto the roof covering.

B. Cap Flashing: Material used to cover top edge of base flashings or other flashings to prevent water seepage behind base flashing. Cap flashing overlaps base flashing.

C. Collar: Pre-formed flange placed over vent pipe to seal roof around vent pipe opening. Also called vent sleeve.

D. Drip Edge: Non-corrosive, non-staining material used along eaves and rakes to allow water runoff to drip clear of underlying building.

E. Flange: Metal pan extending up and down roof slope around flashing pieces. Usually at plumbing vents.

F. Flashing: Components used to prevent seepage of water into a building around any intersection or projection in a roof such as vent pipes, adjoining walls, and valleys.

G. Metal Flashing: Roof components made from sheet metal that are used to terminate roofing membrane or other material alongside roof perimeters as well as at roof penetrations.

H. Penetration: Any object that pierces surface of roof.

I. Pipe Boot: Prefabricated flashing piece used to flash around circular pipe penetrations. Also known as a Roof Jack.

J. Roof Jack: Term used to describe a Pipe Boot or Flashing Collar.

K. Valley: Internal angle formed by intersection of two sloping roof planes to provide water runoff.

L. Vent: Any outlet for air that protrudes through roof deck such as pipe or stack. Any device installed on roof, gable or soffit for purpose of ventilating underside of roof deck.

M. Vent Sleeve: See collar.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

1.04 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Galvanized Sheet Metal Flashing and Trim Manufacturers:
   1. Acceptable Manufacturers Of Metal:
      a. CMG - Coated Metals Group, Denver, CO www.cmgmetals.com.
      b. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
      c. Fabral, Lancaster, PA www.fabral.com.
      d. Firestone Metal Products, Anoka, MN www.unaclad.com.
      e. MBCI, Houston, TX www.mbci.com.
      f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
      g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
      h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
      i. Ryerson, Chicago, IL www.ryerson.com.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
   1. 16 ga (1.262 mm) for metal protective cover.
   2. 22 ga (0.792 mm) for hold-down clips.
   3. 24 ga (0.635 mm) for all other.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.
   3. Thickness:
      a. 16 ga (1.262 mm) for metal protective cover.
      b. 22 ga (0.792 mm) for hold-down clips.
      c. 24 ga (0.635 mm) for all other.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

2.04 FACTORY FABRICATED ITEMS

A. Galvanized Reglets:
   1. Acceptable Products:
      a. Fry Springlock Reglets by Fry Reglet Corp, Alhambra, CA www.fryreglet.com.

B. Stainless Steel Reglets:
   1. Acceptable Products:
      a. Fry Springlock Reglets by Fry Reglet Corp, Alhambra, CA www.fryreglet.com.

C. Metal Soffit Panels:
   1. Performance:
      a. Design Criteria:
         1) Flush panel design.
            (a) Panels shall be interlocked full length of panel.
            (b) Panel widths shall be Manufacturer's standard.
         2) Performance Standard: ATAS Wind-LOK Soffit MPS120.

3) Perforation a required option where indicated. Perforated full width of panel with holes designed so one dimension does not exceed 1/8 inch.

2. Materials:
   a. 0.032 inch thick minimum 3105-H24 alloy aluminum meeting requirements of ASTM B209.
   b. 24 ga galvanized steel meeting requirements of ASTM A653/A653M, G 90.
   c. 24 ga minimum 50 ksi galvalume steel meeting requirements of ASTM A792/A792M AZ-55.
3. Fabrication:
   a. Panels shall be uniformly dimensioned, roll formed to lengths to avoid trimming.
   b. Panel system shall be anchored as recommended by Manufacturer.
   c. Panels shall be continuous.
4. Finish:
5. Polyvinylidene Fluoride (PVF2) Resin-base (Kynar 500 or Hylar 5000) finish for coil coating components containing 70 percent minimum PVF2 in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
6. Color as selected by Architect from Manufacturer's standard colors.
7. Accessories:
   a. Continuous Soffit Vent:
   b. Acceptable Products:
      1) Aluminum 8.8 sq in net free ventilation per lineal foot. Width: 2 inches. Color: white or brown.
         (a) Mastic VAS70 Vent-A-Strip (Model 70) by Mastic Home Exteriors by Ply Gem Chicago, IL www.mastic.com/.
      2) Aluminum 9.9 sq in net free ventilation per lineal foot. Width: 2-1/4 inches. Color: white or brown.
         (a) Mastic VAS79 Vent-A-Strip (Model 79) by Mastic Home Exteriors by Ply Gem Chicago, IL www.mastic.com/.

D. Installation:
   1. Conceal fasteners where possible. Paint heads of exposed fasteners to match background.
   2. Isolate from dissimilar metals to prevent electrolytic action.

2.05 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers of strength and type consistent with function.

B. Concealed Sealants: Non-curing butyl sealant.

C. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

D. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Install with small, watertight seams.

B. Slope to provide positive drainage.

C. Provide sufficient hold down clips to insure true alignment and security against wind.

D. Provide 4 inch (100 mm) minimum overlap.

E. Allow sufficient tolerance for expansion and contraction.

F. Insulate work to prevent electrolytic action.

G. Roof Diverter (Kickout Diverter):
   1. Extend roof diverter 1 inch (25 mm) minimum beyond face edge of lower roof.
   2. Extend underlayment vertically up wall behind flashing.
   3. Solder all joints.
   4. Apply sealant.

3.04 CLEANING

A. Leave metals clean and free of defects, stains, and damaged finish.

3.05 SCHEDULE

A. Roof Diverter:
   1. Roof Diverter (Kickout Diverter) required when vertical wall extends beyond lower roof.
      a. 24 ga (0.635 mm) pre finished galvanized steel meeting requirements for sheet metal specified in materials above.
      b. Size: 6 inch x 6 inch by 12 inches length.

B. Step Flashing:
   1. Step flashing required for steep slope for roof to wall flashing.
      a. 24 ga pre-finished galvanized steel meeting requirements for sheet metal specified in materials above.
      b. Size: 5 inch x 5 inch by 8 inch or 12 inches length.

C. Asphalt Shingle Flashing:
   1. Including Formed Valley Metal, Pipe flashing for vent piping and flues, Roof jacks, Saddles and curb flashings, Miscellaneous flashing.
   2. Formed Valley Metal And Drip Edge:
      a. Material: Aluminum: 0.032 inch thick minimum or Steel: Minimum 24 ga, hot-dipped galvanized to meet requirements of ASTM A653/A653M, 1.25 oz/sq ft. or galvalume meeting requirements of ASTM A792/A792M AZ50, 50 ksi.
      b. Profile: Form accurately to details. Provide formed valley metal in 10 foot lengths with one inch 'V' crimp and break in center to match roof slopes. Profiles, bends, and intersections shall be even and true to line.

D. Gutters and Downspouts:
   1. Materials
      a. Steel:
         1) Downspouts: Rectangular, 26 ga (0.0217 inches - 0.5512 mm) galvanized steel including necessary elbows.
         2) Gutters: 24 ga (0.0276 inches - 0.7010 mm) galvanized steel.
         3) Brackets: 22 ga (0.0336 inches - 0.8534 mm) galvanized steel or 26 ga (0.0217 inches - 0.478 mm) double-hemmed minimum.
      b. Aluminum:
         1) Downspouts: Rectangular 0.032 inch (0.813 mm) minimum aluminum including necessary elbows.
         2) Gutters: 0.04 inch (1.0 mm) minimum aluminum.

3) Brackets: 0.06 inch (1.52 mm) minimum aluminum.

c. Screws, Bolts, Nails, And Accessory Fasteners: Non-corrosive and of strength and type consistent with function.

d. Downspouts, gutters, brackets, fasteners, and accessories shall be compatible material.

2. Fabrication:
   a. Fabricate in accordance with SMACNA Architectural Manual recommendations, where applicable.
   b. Cross-sectional configuration of gutter shall be Style A, (Page 1.13 6th Edition) of SMACNA Architectural Manual.
   c. Form accurately to details.
   d. Profiles, bends, and intersections shall be even and true to line.
3. Finishes:
   a. Metal exposed to view shall have face coating of Polyvinylidene Fluoride (PVF2) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF2 in resin portion of formula.
      1) Thermo-cured two (2) coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
      2) Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
   b. Color as selected by Architect from Manufacturer's standard colors.
4. Installation:
   a. Allow no more than 40 feet between downspouts. Lap joints in downspouts 1-1/2 inches minimum in direction of water flow.
   b. Furnish and install outlet tubes and gutter ends where required. Furnish and install expansion joints in runs exceeding 50 feet and in runs that are restrained at both ends. Lap other joints in gutter one inch minimum, apply sealant in lap, and stainless steel rivet one inch on center maximum.

E. Aluminum Fascia:
1. Materials:
   a. Aluminum: 0.032 inch thick minimum complete with accessories recommended by Manufacturer for proper installation.
2. Finishes:
   a. Face coating Polyvinylidene Fluoride (PVF2) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing 70 percent minimum PVF2 in resin portion of formula. Thermocured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
   b. Color as selected by Architect from Manufacturer's standard colors.
3. Fabrication: Fascia may either be shop-fabricated using metal from a specified manufacturer, or a factory-fabricated standard system from a specified manufacturer.

F. Steel Fascia:
1. Materials:
   a. Minimum 24 ga (0.635 mm), hot-dipped galvanized to meet requirements of ASTM A653/A653M, 1.25 oz/sq ft or galvalume meeting requirements of ASTM A792/A792M AZ50, 50 ksi and complete with accessories recommended by Manufacturer for proper installation.
2. Finishes:
   a. Face coating Polyvinylidene Fluoride (PVF2) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing 70 percent minimum PVF2 in resin portion of formula. Thermocured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
   b. Color as selected by Architect from Manufacturer's standard colors.

3. Fabrication: Fascia may either be shop-fabricated using metal from a specified manufacturer, or a factory-fabricated standard system from a specified manufacturer.

G. Roof Jacks For Metal Flues: Factory-made galvanized steel.

H. Pipe Flashing For Concentric Piping Flashing Retrofitting:
   1. Description:
      a. Black EPDM Pipe flashing for existing Concentric Piping for reroofing existing roofs (cutting Concentric Roof Termination cap off and replacing is not permitted).
      b. Weather resistance to withstand ultra violet light and ozone.
      c. Malleable base to conform to different roof pitches.
      d. Pipe size: 1/2 inch to 4 inch.
         1) On-site customization.
      e. Fasteners included.
   2. Acceptable Products:
      a. Aztec RF101BP.

I. Pipe Flashing For Plumbing Vent Lines metal flues, and HVAC Air Piping: Ultra-pure high consistency molded one hundred (100) percent silicone rubber pipe boot that prevents cracking and splitting for life of roof.
   1. Product:

END OF SECTION

SECTION 07 6210

GALVANIZED STEEL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install miscellaneous flashing, counterflashing, and hold-down clips as described in Contract Documents and not specified to be of other material.

B. Products Furnished But Not Installed Under This Section:
   1. Gravel stops, copings, scuppers, and miscellaneous sheet metal specialties not specified to be of other materials.

C. Related Requirements:
   1. Section 06 1100: 'Wood Framing' for wood base.
   2. Sections under 07 5000 heading: 'Membrane Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
   3. Section 07 9213: 'Elastomeric Joint Sealant'.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
      b. ASTM A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
   2. Federal Specifications:
      a. TT-S-00230C(2) Sealing Compound, Elastomeric Type, Single Component, (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Type Two Acceptable Manufacturers Of Metal:
      a. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
      b. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
      c. Fabral, Lancaster, PA www.fabral.com.
      d. Firestone Metal Producdts, Anoka, MN www.unaclad.com.
      e. MBCI, Houston, TX www.mbci.com.
      f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
      g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
      h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
      i. Ryerson, Chicago, IL www.ryerson.com.
      j. Equal as approved by Architect before installation. See Section 01 6200.

B. Materials:
   1. Sheet Metal:

a. Galvanized iron or steel meeting requirements of ASTM A653/A653M, G 90 or Galvalume steel meeting requirements of ASTM A792/A792M AZ50, 50 ksi.
   1) 22 ga (0.792 mm) for hold-down clips.
   2) 24 ga (0.635 mm) for all other.

C. Fabrication:
   1. Form accurately to details.
   2. Profiles, bends, and intersections shall be even and true to line.
   3. Fold exposed edges 1/2 inch (12.7 mm) to provide stiffness.

D. Finish:
   1. Exposed to view:
      a. Provide face coating of polyvinyledene Fluoride (PVF_2) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF_2 in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
      b. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
   2. Color as selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

A. Sealants: Rubber base type conforming to Fed Spec TT-S-00230C.

B. Fasteners:
   1. Of strength and type consistent with function.
   2. Nails: Hot-dipped galvanized.
   3. Screws, Bolts, And Accessory Fasteners: Galvanized or other acceptable corrosion resistant treatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install with small, watertight seams.

B. Slope to provide positive drainage.

C. Provide sufficient hold down clips to insure true alignment and security against wind.

D. Provide 4 inch (100 mm) minimum overlap.

E. Allow sufficient tolerance for expansion and contraction.

F. Insulate work to prevent electrolytic action.

3.2 CLEANING

A. Leave metals clean and free of defects, stains, and damaged finish.

END OF SECTION

SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install gutters and downspouts as described in Contract Documents.

B. Related Requirements:
   1. Section 07 9213: 'Elastomeric Joint Sealant', for quality of sealants for joints.

1.2 REFERENCES

A. Reference Standard:
   1. Sheet Metal & Air Conditioning Contractors National Association Inc:
      a. SMACNA Architectural Sheet Metal Manual, (7th edition 2012).

1.3 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Show gutter cross-section, mounting method, gauge of metal, expansion joint design and locations, and downspout locations minimum.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Type Two Acceptable Manufacturers of Metal:
      a. ATAS Aluminum Products, Allentown, PA www.atas.com.
      b. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
      c. Fabral, Jackson, GA www.fabral.com.
      d. Firestone Metal Products, Anoka, MN www.unaclad.com.
      e. MBCI, Houston, TX www.mbci.com.
      f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
      g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
      h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
      i. Reynolds Metals Company, Richmond, VA www.rmc.com.
      j. Ryerson, Chicago, IL www.ryerson.com.
      k. Equal as approved by Architect before installation. See Section 01 6200.

B. Materials
   1. Aluminum:
      a. Downspouts: Rectangular 0.032 inch (0.813 mm) minimum aluminum including necessary elbows.
      b. Gutters: 0.04 inch (1.0 mm) minimum aluminum.
      c. Brackets: 0.06 inch (1.52 mm) minimum aluminum.
   2. Screws, Bolts, Nails, And Accessory Fasteners: Non-corrosive and of strength and type consistent with function.

3. Downspouts, gutters, brackets, fasteners, and accessories shall be compatible material.

C. Fabrication:
1. Fabricate in accordance with SMACNA Architectural Manual recommendations, where applicable.
2. Cross-sectional configuration of gutter shall be Style A, (Page 1.13 6th Edition) of SMACNA Architectural Manual.
3. Form accurately to details.
4. Profiles, bends, and intersections shall be even and true to line.

D. Finishes:
1. Metal exposed to view shall have face coating of polyvinyledene Fluoride (PVF_2) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF_2 in resin portion of formula.
   a. Thermo-cured two (2) coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
   b. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
2. Color as selected by Architect from Manufacturer's standard colors.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection Of In-Place Conditions:
1. Before starting work, verify governing dimensions at building. Inspect for conditions that would prevent installation of specified system. Do not install over improper conditions.
2. Insulate work from fascia as necessary to prevent electrolytic action.

3.2 INSTALLATION

A. Allow no more than 40 feet (12 meters) between downspouts. Lap joints in downspouts 1-1/2 inches (38 mm) minimum in direction of water flow.

B. Furnish and install outlet tubes and gutter ends where required. Furnish and install expansion joints in runs exceeding 50 feet (15 meters) and in runs that are restrained at both ends. Lap other joints in gutter one inch (25 mm) minimum, apply sealant in lap, and stainless steel rivet one inch (25 mm) on center maximum.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
1. At completion of this work, block downspouts and flood gutters.
2. Notify Architect two (2) working days before testing.
3. Repair leaks and adjust for proper drainage.

3.4 CLEANING

A. Leave metals clean and free of defects, stains, and damaged finish.

END OF SECTION

SECTION 07 7233

ROOF HATCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Supplied But Not Installed Under This Section:
   1. Roof hatches and scuttles indicated on Contract Drawings including:
      a. Related hardware and attachments.
      b. Safety post for fixed ladders in roof hatches.

B. Related Requirements:
   1. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of roof hatches and safety post in roof hatches.
   2. Sections Under 07 5000 Heading: Membrane Roofing.
   3. Section 07 9219: 'Elastomeric Joint Sealants' for sealant.

1.2 REFERENCES

A. Association Publications:
   1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910 Subpart D: Walking-Working Surfaces:
         1) 1910.23 (e) - Guarding floor and wall openings and holes.
         2) 1910.27 (c) - Hatch Covers.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Roof Hatch:
         1) Manufacturer's technical data for each type of hatch assembly, including setting drawings, templates, finish requirements, and details of anchorage devices.
            a) Include locations, construction details, finishes, latching or locking provisions, and other pertinent data.
   2. Shop Drawings:
      a. Roof Hatch:
         1) Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected Work.
            a) Hatch Units: Show types, elevations, thickness of metals, and full size profiles.
            b) Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.

B. Informational Submittals:
   1. Manufacturers' Instructions:
      a. Roof Hatch:
         1) Indicate installation requirements and rough-in dimensions.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Roof Hatch:
            a) Final, executed copy of Warranty.
         2) Roof Hatch Safety Railing:
            a) Final, executed copy of Warranty.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. OSHA Compliance:
      a. Provide safety post for fixed ladders as required by OSHA Standard 1910.27 and as specified in this Section.
         1) Meet minimum concentrated load of 200 lbs (90 kg) load.

B. Qualifications:
   1. Manufacturer:
      a. Company specializing in manufacturing and installation of components specified in this Section with minimum of five (5) years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.

B. Storage And Handling Requirements:
   1. Store materials under cover in dry and clean location off ground. Remove materials that are damaged or otherwise not suitable for installation from Project site and replace with acceptable materials at no additional cost to Owner.
   2. Exercise proper care in handling of Work so as not to injure finished surfaces. Protect Work from damage after it is in place.

1.6 WARRANTY

A. Roof Hatch:
   1. Provide Manufacturer's standard written warranty for materials and workmanship against defects.

B. Roof Hatch Safety Railing:
   1. Provide Manufacturer's five (5) year minimum warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Babcock-Davis Hatchways Inc, Arlington, MA www.babcock-davis.com.
   2. The Bilco Company, New Haven, CT www.bilco.com.
   3. Dur-Red Products, Cudahy, CA www.dur-red.com.
   4. Milcor, Bensenville, IL www.milcorinc.com.
   5. Equal as approved by Architect before bidding. See Section 01 6200.

2.2 MANUFACTURED UNITS

A. Roof Hatch:
   1. Design Criteria:
      a. Provide 36 inch (915 mm) x 30 inch (762 mm) for ladder access.
      b. Provide corrosion resistance finish.

   2. Cover And Curb:
      a. Cover: 11 ga (3.2 mm) mill finish aluminum.

b. Cover Lining: 18 ga (1.3 mm) mill finish aluminum cover liner.
c. Curb Height: 12 inches (300 mm) with 3-1/2 inch (89 mm) flange for mounting, with integral cap flashing.
d. Insulate curb and cover with one inch (25 mm rigid fiberglass.

3. Performance Standard: Bilco S-50.

2.3 ACCESSORIES

A. Roof Hatch Safety Railing:
1. Description:
a. OSHA compliant Safety Railing for new and retrofit applications.
b. Safety railing mounts to new or existing roof hatch curb counterflashing without penetrating membrane.
2. Design Criteria:
a. Compliance: OSHA 29 CFR1910.23 for guarding floor and wall openings and holes.
b. Self-Closing Gate.
3. Basis of Design: Babcock-Davis model BSRCA 36x30 FG

B. Safety Post For Fixed Ladders:
1. Description:
a. Safety post for fixed vertical ladders used with roof hatches.
b. Telescoping post permanently mounts to top two (2) rungs of fixed ladder providing positive hand-hold and enabling user to enter or exit roof hatch in upright and balanced position.
c. Post locks automatically when fully extended.
2. Comply with requirements of Regulatory Agency Sustainability Approvals as specified in Quality Assurance in Part 1 of this specification.
3. Finish: Hot dip galvanized or mill finish aluminum.
4. Acceptable Manufacturers:
a. Safety Post by Babcock-Davis Hatchways Inc, Arlington, MA www.babcock-davis.com.
b. LadderUP Safety Post (Model LU-4) by The Bilco Company, New Haven, CT www.bilco.com.
c. Extend-A-Rail (Model ER-1) by Precision Ladders, LLC, Morristown, TN www.precisionladders.com.
d. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Verify areas and conditions under which roof hatches is to be located and identify conditions detrimental to proper or timely completion.
2. Verify deck, cubs, roof membrane, base flashing and other items affecting Work of this section are in place and positioned correctly.
3. Verify dimensions and tolerances.
a. Report unsatisfactory conditions in writing to Architect.
b. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

A. Follow Manufacturer’s instructions for installing Roof Hatch, Safety Post, and related accessories and attachments.

3.3 ADJUSTING

A. Test-operate roof hatch with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.4 CLEANING

A. General:
   1. Clean exposed surfaces per manufacture's written instructions. Touch up damaged metal coatings.

B. Waste Management:
   1. Disposal:
      a. Remove debris resulting from work of this Section from roof and site in approved waste receptacle.

END OF SECTION

SECTION 07 7246

ROOF WALKWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes but not limited to:

1. A Rooftop Walkway System consisting of Non-Slip, Interlocking grating planks with Support Plates and attachment clamps to mount to a Standing Seam or Rib Panel Metal Roof. An optional guard rail system consisting of a pipe rail at 42" High and a mid-rail at 21" High, assembled with structural slip- on pipe fittings, vertical posts 6'-0" typical on-center and attached to Railing Support Plates, Designed to meets OSHA requirements of 200lb lateral load. An optional LEVEL surface up to a 6:12 pitch is available for perpendicular Runs of the Metalwalk system. All parallel runs follow the slope.

B. Related Sections:

1. Division 1: Administrative, procedural, and temporary work requirements.

2. Section 05 5214 - Galvanized Pipe and Tube Railings

3. Section 13 3421 - Pre-Engineered Structures.

1.2 REFERENCES

A. ASTM A653 Standard Specification for Steel sheet, Zinc coated (Galvanized) by hot-dip process, commercial quality.

B. ASTM A792 Standard Specification for Steel sheet, Aluminum-Zinc (Galvalume) alloy coated by the hot-dip process, General requirements.

C. ASTM B209-86 Specification for Aluminum and Aluminum Alloy sheet and plate.

D. ASTM B221 Specification for Aluminum (S-5™ Clamps & Pipe Fittings). E. ASTM A500 Posts and Top Rails, General performance.

E. ASTM B117 Salt Spray Test - Exterior and Interior Zinc coating on tubing.

F. ASTM B179 & ASTM B26 high tensile 525.2 Aluminum/Magnesium Alloy slip on/bolt-on pipe fittings.

G. IBC — International Building Code—2012—1607.8.1, Exception 2.

H. OSHA — Occupational Safety and Health Administration, 1926.502 (b)(1)(2)(3)

1.3 SUBMITTALS

A. SHOP DRAWINGS:

1. Architect / Contractor submit proposed layout and detail to manufacturer for review.

2. A Design / Structural Engineer should be consulted to determine feasibility of application, load bearings and safety measures.

B. Manufacturer provides CAD erection details and Bill of Materials. Engineering Load Tests available.

1.4 DELIVER, STORAGE AND HANDING

A. Deliver METALWALK Grating, Railing and Accessories to job site properly packaged to protect against transportation damage.

B. Handling of material to prevent bending, twisting and loss. Store all materials and accessories off the ground on platforms. All material should be stored under cover.

1.5 WARRANTIES

A. Provide manufacturers 2-year warranty providing coverage against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. METALWALK Grating Sections: Cooper Industries. - Pinckneyville, IL.

B. Rail Tubing: Allied Tube & Conduit – Harvey, IL.

C. Structural Slip-On/Bolt-On Pipe Fittings: Hollaender Manufacturing Company — Cincinnati, OH

D. Components and Hardware: Design Components, Inc. — Atlanta, GA

E. S-5 ™ Clamps – Metal Roof Innovations, Ltd.

2.2 MATERIALS

A. RAILING

1. All handrails shall be fabricated using CMT-20 cold rolled high strength steel tubing with a three-step exterior coating process consisting of Hot-Dipped Uniform Zinc Galvanizing, a Conversion coating and a clear Polymer topcoat. Interiors walls to have corrosion resistant coating.

2. Dimensions - Normal Pipe Size 1.9” O.D. 1 1/2” NPS., 13 gauge (.083 min.)

3. Standard Length - 10’-0”(other lengths available).

B. PIPE FITTINGS

1. Speed Rail® Slip-On Fittings with setscrews; wrench size = 3/16”. Fittings shall be high tensile Aluminum Magnesium Alloy.

C. METALWALK Grating Sections

1. 18 gauge, G90 Galvanized Steel. [AZ-50 Galvalume Steel & .080 Aluminum available]

2. Section Width - 12” . [6” & 9” widths available]

3. Standard Length - 10’, 12’,20’ & 24’ [other lengths available]

4. Channel Height - 2 ½” [other heights available]

5. Flange Options - Female/Male, Male/Male

6. Surface Condition - Anti-Skid

D. COMPONENTS & ACCESSORIES

1. Support Plates - 14-gauge Galvanized Steel, pre-punched to accept Square Base Flange for Vertical Post. [Aluminum available if no handrail is required]

2. Splice Channels, Ledger Angles - 18- & 14-gauge Galvanized Steel.

3. Clips, Clamps, Bolts, Nuts and Washers will be Stainless Steel, compatible non-corrosive material, or Electro- Plated and size as specified.

4. S-5™ Clamps 6061-T6 Aluminum with Stainless Steel Set Screws, Bolt and Washer.

E. LOAD TABLE

1. Grating - Average Galvanized Steel weight 3.0 pounds per lineal foot or square foot (12"wide).

2. Handrail - Average Galvanized Steel weight 1.40 pounds per lineal foot (single rail).

3. Vertical Posts - Average Galvanized Steel weight 5 lbs. each.

2.3 FABRICATION

A. Railing is continuously roll-formed to tubular shape, then welded along its length to form virtually seamless tubing with swedged ends

B. Roll form METALWALK Grating in continuous lengths.

C. Fabricated Supports, Splice Channels and Ledger Angles by press brake and punch press.

D. Special clips die formed or Cast Aluminum

E. S-5™ Clamps 6061-T6 Aluminum

2.4 FINISH

A. Mill Finish - Standard

B. Painted - Powder Coat after fabrication by manufacturer

C. By others in the field

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation, verify:

1. Panel seaming is complete.

2. Panel attachment is sufficient to withstand loads transferred from clamps. 3– Installation will not impede drainage.

3. Panel rib spacing and height have been verified with Design Components, Inc. 5– Pitch for level system (if applicable) with Design Components, Inc.

3.2 INSTALLATION

A. Install METALWALK Grating sections in accordance with manufacturer's recommendations and shop drawings.

B. Position METALWALK Grating sections flat and square with ends bearing a minimum of 2" on supporting structure.

C. Keep METALWALK Grating sections at least 1/4" away from structural steel and 1/2" from concrete walls.

D. Allow clearance at joints between grating sections of maximum 1/4" at Splice Channels.

E. Allow clearance at perpendicular intersection of a maximum 3/8" at the end.

F. A Design/Structural Engineer should be consulted to determine feasibility of application, load bearings and safety measures.

END OF SECTION

SECTION 07 8400

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install firestopping not involving penetrations as described in Contract Documents.
   2. Quality of firestopping materials and systems used for penetrations on Project, including submittal requirements.

B. Related Requirements:
   1. Furnishing and installing of penetration firestopping specified under Section installing work penetrating structure.
   2. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing' for top runner firestop track in metal stud walls allowing partition heads to expand and contract with movement of structure.

1.2 REFERENCES

A. Reference Standards:
   1. American Society For Testing And Materials:
      a. ASTM E84-18b, ‘Standard Test Method for Surface Burning Characteristics of Building Materials'.
      b. ASTM E119-18c, ‘Standard Test Methods for Fire Tests of Building Construction and Materials’.
      c. ASTM E814-13a(2017), ‘Standard Test Method for Fire Tests of Penetration Firestop Systems'.
      d. ASTM E1996-17, ‘Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes’.
   2. California Building Code (CBC) (2016 or latest approved edition):
      a. Chapter 7, 'Fire And Smoke Protection Features':
         1) Section 703, "Fire-Resistance Ratings And Fire Tests':
   3. Underwriters Laboratories:
      a. UL 'Fire Resistance Directory', current edition, contains listing of approved Penetration Firestop Systems:
         1) Through-penetration firestop devices.
         2) Fire resistance ratings.
         3) Through-penetrations firestop systems.
         4) Fill, void, or cavity material.
      b. UL 263, 'Fire Tests of Building Construction and Materials' (14th Edition).
      c. UL 723: ‘Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th edition - 2018).
      d. UL 1479, 'Standard for Safety for Fire Tests of Through-Penetration Firestops' (4th Edition).
      e. UL 2079, 'Tests for Fire Resistance of Building Joint Systems' (5th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed in compliance with specific requirements.
   2. Coordinate sizes of sleeves, openings, core drilled holes, or cut openings to accommodate through-penetration firestop systems.

B. Sequencing:
1. Perform work of this section in proper sequence to prevent damage to firestop system and to ensure installation will occur prior to enclosing or concealing work. Firestopping shall precede finishing of gypsum board.
a. Do not conceal firestopping installations until the inspection agency or authorities having jurisdiction, as required, have examined each installation.

1.4 SUBMITTALS

A. Action Submittals:
1. Shop Drawings:
a. Show each type of Penetration Firestop System to be used on Project with design approval reference number.
b. Identify locations where each type of Penetration Firestop System is to be installed.

B. Informational Submittals:
1. Qualification Statement:
a. Manufacturer/Installer:
1) Provide Qualification documentation if requested by Architect or Owner.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Conform to applicable building codes for fire resistance ratings.
2. Comply with installation requirements and protocol outlined in Firestop Contractors International Association 'FICIA 'Manual of Practice' handbook.
3. Each Penetration Firestop System shall be UL/ULC listed for that type of penetration occurring on Project.
4. Ratings shall be in accordance with ASTM E814, UL 1479, or IBC Section 703, "Fire-Resistance Ratings And Fire Tests' as acceptable to local code authority.
a. Provide Firestop Systems with F Ratings not less than Fire-Resistance Rating of Constructions penetrated.
b. Provide Firestop Systems with T and F Ratings, as determined per ASTM E814.
c. Provide Joint Sealants with Fire-Resistance Ratings as determined per ASTM E119.
d. Provide Products with Flame-Spread values of less than 25 and smoke developed values of less than 450, as determined per ASTM E84.
e. Surface burning characteristics (per ASTM E84): 25 or less. Tested in accordance with UL 1479 or ASTM E814.

B. Qualifications:
1. Manufacturer Qualifications:
a. Company that specializes in manufacturing the type of products specified, with a minimum of five (5) years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Deliver firestopping materials to Project Site in original, new unopened containers or packages bearing manufacturer’s printed labels.

B. Storage And Handling Requirements:
1. Store and handle firestopping materials in compliance with manufacturers written instructions.
2. Protect materials from freezing or overheating and to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.
3. Store materials off floor at temperatures between 40 deg F (4.4 deg C) and 90 deg F (32.2 deg C)

1.7 FIELD CONDITIONS

A. Ambient Conditions:
1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.
2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.8 WARRANTY

A. Manufacturer Warranty:
1. Firestop materials shall be free from cracking, checking, dusting, flaking, spalling, separation, and blistering for period of 10 years from Date of Substantial Completion. Reinstall or repair such defect or failures at no cost to Owner.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Acceptable Manufacturers:
a. Members of International Firestop Council www.firestop.org and member in good standing.
b. Equal as approved by Architect before installation. See Section 01 6200.

B. Materials:
1. General:
a. Sealant, packing material, or collar system required by Firestop Manufacturer for Firestop Penetration System to comply with listed design.
b. Primers, sleeves, forms, insulation, packing, stuffing, and accessories: Type required for tested assembly design.
2. Firestopping Assembly Requirements:
a. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
b. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
c. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
3. Firestopping System:
a. Any material meeting requirements.
4. Firestop Tracks (Metal Stud Framing):
a. Metal Stud Manufacturer's top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly by factory applied cured intumescent fire stop material affixed to steel profile; in thickness, not less than indicated for studs and in width to accommodate depth of studs.
1) Type Two Acceptable Products:
a) BlazeFrame Deflection Track by ClarkDietrich Buiding Systems.
b) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
   3. Verify ducts, piping, equipment, and other similar items that would interfere with application of firestopping shall be in place.
   4. Do not commence Work until unsatisfactory conditions have been corrected.
      a. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
   1. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   2. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.

B. Surface Preparation:
   1. Clean out openings, control, and expansion joints immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
      a. Remove foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
      b. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
      c. Remove laitance and form release agents from concrete.
      d. Do not apply firestopping materials to surfaces which have been previously painted or treated with sealer, curing compound, water repellent, or other similar coating, unless application has been accepted by manufacturer of firestopping products.
      e. Install damming materials, as recommended by sealant manufacturer, to hold sealant in place.
   2. Priming:
      a. Prime substrates where recommended by firestopping manufacturer using manufacturer's recommended products and methods.
      b. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
      c. Apply prime coat in compliance with manufacturer’s instructions.

3.3 INSTALLATION

A. General:
   1. Install firestopping in accordance with Manufacturer’s instructions for installation of firestopping products.
   2. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
   3. Do not cover installed firestopping until inspected by authority having jurisdiction.

3.4 PROTECTION

A. Protect surfaces adjacent to through-penetration firestops with suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.

B. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

3.5 CLEANING

A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

END OF SECTION

SECTION 07 9213

ELASTOMERIC JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install sealants not specified to be furnished and installed under other Sections.
   2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.

B. Related Requirements:
   1. Furnishing and installing of sealants is specified in Sections specifying work to receive new sealants.
   2. Section 07 2419: Sealants for EIF Systems.

C. Products Furnished But not Installed Under This Section:
   1. Interior Ceramic Tile Joint Sealants:

D. Related Requirements:
   1. Section 09 3013: 'Ceramic Tiling'.

1.2 REFERENCES

A. Definitions:
   1. Sealant Types and Classifications:
      a. ASTM Specifications:
         1) Type:
            a) Type S: Single-component sealant.
            b) Type M: Multi-component sealant.
         2) Grade:
            a) Grade P: Pourable or self-leveling sealant used for horizontal traffic joints.
            b) Grade NS: Non-sag or gunnable sealant used for vertical and non-traffic joints.
         3) Classes: Represent movement capability in percent of joint width.
            a) Class 100/50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand of at least 100 percent increase and decrease of at least 50 percent of joint width as measured at time of application.
            b) Class 50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 50 percent of joint width as measured at time of application.
            c) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
            d) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
         4) Use:
            a) T (Traffic): Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
            b) NT (Non-Traffic): Sealant designed for use in joints in non-traffic areas.
            c) I (Immersion): Sealant that meets bond requirements when tested by immersion (Immersion rated sealant applications require primer).
            d) M (Mortar): Sealant that meets bond requirements when tested on mortar specimens.

e) G (Glass): Sealant that meets bond requirements when tested on glass specimens.
f) A (Aluminum): Sealant that meets bond requirements when tested on aluminum specimens.
g) O (Other): Sealant that meets bond requirements when tested on substrates other than standard substrates, being glass, aluminum, mortar.

2. Silicone: Any member of family of polymeric products whose molecular backbone is made up of alternating silicon and oxygen atoms and which has pendant hydrocarbon groups attached to silicon atoms. Used primarily as a sealant. Offers excellent resistance to water and large variations in temperature (minus 100 deg F to + 600 deg F) (minus 73.3 deg C to + 316 deg C).

B. Reference Standards:
1. ASTM International:
a. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
b. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
c. ASTM C1330-18, 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
d. ASTM C1481-12(2017) 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
e. ASTM D5893/D5893M-16, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
1. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.
2. Ensure sealants are cured before covering with other materials.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
a. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
b. Manufacturer's literature for each Product.
c. Schedule showing joints requiring sealants. Show also backing and primer to be used.

B. Informational Submittals:
1. Certificates:
a. Manufacturer's Certificate:
1) Certify products are suitable for intended use and products meet or exceed specified requirements.
2) Certificate from Manufacturer indicating date of manufacture.
2. Manufacturers' Instructions:
a. Manufacturer's installation recommendations for each Product.
b. Manufacturer's installation for completing sealant intersections when different materials are joined.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten (10) years documented experience.
2. Applicator Qualifications:
a. Company specializing in performing work of this section.

b. Provide if requested, reference of projects with minimum three (3) years documented experience, minimum three (3) successfully completed projects of similar scope and complexity and approved by manufacturer.
c. Designate one (1) individual as project foreman who shall be on site at all times during installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
1. Deliver and keep in original containers until ready for use.
2. Inspect for damage or deteriorated materials.

B. Storage and Handling Requirements:
1. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
2. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
3. Store in a cool dry location, but never under 40 deg F (4 deg C) or subjected to sustained temperatures exceeding 90 deg F (32 deg C) or as per Manufacturer's written recommendations.
4. Do not use sealants that have exceeded shelf life of product.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
1. Do not install sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.
2. Follow Manufacturer’s temperature recommendations for installing sealants.

1.8 WARRANTY

A. Manufacturer Warranty:
1. Signed warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of three (3) years from date of Substantial Completion.
a. Manufacturer's standard warranty covering sealant materials.
b. Applicator’s standard warranty covering workmanship.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Manufacturer Contact List:
a. Dow Corning Corp., Midland, MI www.dowcorning.com.
b. Franklin International, Inc. Columbus, OH www.titebond.com.
c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).
d. Laticrete International Inc., Bethany, CT www.laticrete.com.
e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/silicones.
f. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
g. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com
h. Tremco, Beachwood, OH www.tremcosealants.com

B. Materials:
1. Design Criteria:
a. Compliance: Meet or exceed requirements of these standards:
1) ASTM C920: Elastomeric joint sealant performance standard.
2) ASTM D5893/D5893M: Silicone Joint Sealant for Concrete Pavements.

b. Comply with Manufacturer's ambient condition requirements.
c. Sealants must meet Manufacturer's shelf-life requirements.
d. Sealants must adhere to and be compatible with specified substrates.
e. Sealants shall be stable when exposed to UV, joint movements, and environment prevailing at project location.
f. Primers (Concrete, stone, masonry, and other nonporous surfaces typically do not require a primer. Aluminum and other nonporous surfaces except glass require use of a primer. Installer Option to use Adhesion Test to determine if primer is required or use primer called out in related sections):
    1) Adhesion Test:
        a) Apply silicone sealant to small area and perform adhesion test to determine if primer is required to achieve adequate adhesion. If necessary, apply primer at rate and in accordance with Manufacturer's instructions. See 'Field Quality Control' in Part 3 of this specification for Adhesive Test.
    2) If Primer required, shall not stain and shall be compatible with substrates.
    3) Allow primer to dry before applying sealant.

2. Sealants At Exterior Building Elements:
    a. Description:
        1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
            a) Aluminum entrance perimeters and thresholds.
            b) Columns.
            c) Connections.
            d) Door frames.
            e) EIFS to metal joints.
            f) Joints and cracks around windows.
            g) Louvers.
            h) Parapet caps.
            i) Wall penetrations.
            j) Other joints necessary to seal off building from outside air and moisture.
    b. Design Criteria:
        1) Meet following standards for Sealant:
            a) ASTM C920: Type S, Grade NS, Class 50 Use NT, M, G, A.
        2) Limitations:
            a) Do not use below-grade applications.
            b) Do not use on surfaces that are continuously immersed or in contact with water.
            c) Do not use on wet, damp, frozen or contaminated surfaces.
            d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
        3) Color:
            a) Architect to select from Manufacturer's standard colors.
            b) Match building elements instead of window (do not use white that shows dirt easily).
    c. Approved Products. See Section 01 6200.
        1) Dow Corning:
            a) Primer: 1200 Prime Coat.
            b) Sealant: 791 Silicone Weatherproofing Sealant.
        2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
            a) Primer: SS4044 Primer.
            b) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.
        3) Tremco:
            a) Primer:
                (1) Metal surface: No. 20 primer.
                (2) Porous surfaces: No. 23 primer.
            b) Sealant: Spectrum 1 Silicone Sealant.

3. Sealants At EIFS:
    a. Description:
        1) Weatherproofing sealant for long term resistance to natural weathering, including: ultraviolet radiation, high and low temperatures and rain and snow, with negligible change in elasticity. May be used for application to horizontal or vertical surfaces.

b. Design Criteria:
1) Meet following standards for Sealant:
a) Used to seal EIFS to EIFS, not EIFS to other material.
b) ASTM C920: Type S, Grade NS, Class 100/50 Use NT, A, G, O.
c) ASTM C1481 guidelines for use of sealant with EIFS.
2) Limitations:
a) Do not use in structural glazing applications.
b) Do not use on surfaces that are underwater or in continuous contact with water.
c) Do not use on porous substrates.
d) Do not use on wet, damp, frozen or contaminated surfaces.
e) Do not use on surfaces where staining or discoloration may be concern, without prior testing.
f) Do not use on excessively basic or acidic substrates.
3) Color:
a) Architect to select from Manufacturer's standard colors.
b) Match building elements (do not use white that shows dirt easily).
c. Approved Products. See Section 01 6200.
1) Dow Corning:
a) Primer: 1200 Prime Coat.
b) Sealant: 790 Silicone Building Sealant.
2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
a) Primer: SCP3195P Primer.
b) Sealant: GE SCS2700 SilPruf LM Silicone Weatherproofing Sealant.
3) Sika:
a) Primer: Sikaflex Primer 429.
b) Sealant: Sikaflex 2C NS Non-Sag Silicone Sealant.
4) Tremco:
a) Primer: Porous surfaces: No. 23 primer.
b) Sealant: Spectrum 1 Silicone Sealant.

4. Sealants At Exterior Sheet Metal And Miscellaneous:
a. Description:
1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
a) Flashings.
b) Gutters.
c) Penetrations in soffits and fascias.
d) Roof vents and flues.
b. Design Criteria:
1) Meet following standards for Sealant:
a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
2) Limitations:
a) Do not use below-grade applications.
b) Do not use on surfaces that are continuously immersed or in contact with water.
c) Do not use on wet, damp, frozen or contaminated surfaces.
d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
c. Approved Products. See Section 01 6200.
1) Dow Corning: 790 Silicone Building Sealant.
2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
3) Tremco: Tremsil 600 Silicone Sealant.

5. Sealants At Expansion Joints in Exterior Concrete (Aprons, Entryway Slabs, Mowstrips, Retaining Walls, Sidewalks):
a. Expansion Joints:
1) Design Criteria:
a) Meet following standards for Sealant:
(1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
2) Sealant required at expansion for following areas:
a) Between entryway slabs and building foundations.
b) Between sidewalks and building foundations.

c) Miscellaneous vertical applications.
3) Sealant NOT required at expansion joints for following areas:
a) Within aprons and where aprons abut building foundations and sidewalks.
b) Within mowstrips and where mowstrips abut building foundations and sidewalks.
c) Within sidewalks.
4) Approved Products. See Section 01 6200.
a) Dow Corning:
(1) Primer: 1200 Prime Coat.
(2) Sealant: 790 Silicone Building Sealant.
b) Sika:
(1) Primer: Sikasil Primer-2100.
(2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.

b. Penetrations thru Concrete Walls:
1) Design Criteria:
a) Meet following standards for Sealant:
(1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
2) Approved Products. See Section 01 6200.
a) Dow Corning:
(1) Primer: 1200 Prime Coat.
(2) Sealant: 790 Silicone Building Sealant.
b) Sika:
(1) Primer: Sikasil Primer-2100.
(2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.

6. Sealants At Control Joints in Exterior Concrete (Aprons, Entryway Slabs, Mowstrips, Retaining Walls, Sidewalks):
a. Control Joints:
1) Design Criteria:
a) Meet following standards for Sealant:
(1) ASTM C920, Type S, Grade P, Class 100/50; Use T, M, G, A, O.
2) Sealant required at control joints in following areas:
a) Retaining walls.
b) Miscellaneous vertical applications.
3) Sealant is NOT required at control joints, unless needed to protect moisture sensitive soils or by Contract Drawings, in following areas:
a) Within aprons.
b) Within mowstrips.
c) Within sidewalks.
d) Within entryway slabs.
4) Approved Products. See Section 01 6200.
a) Dow Corning:
(1) Primer: 1200 Prime Coat.
(2) Sealant: 890-SL Silicone Building Sealant.
b) Sika:
(1) Primer: Primer: Sikasil Primer-2100.
(2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.

7. Sealants At Exterior Concrete Waterways – Flat Drainage Structures (Waterways:
a. Expansion Joints and Control Joints:
1) Description:
a) One component (part) self-leveling silicon material that cures to ultra-low modulus silicone rubber upon exposure to atmospheric moisture.
b) Cured silicone rubber remains flexible over entire temperature range expected in pavement applications.
2) Design Criteria:
a) Sealant is required at following areas:
(2) Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
b) Meet following standards for Sealant: Self-leveling: ASTM D-5893; ASTM C920, Type S, Grade P, Class 100/50; Use T, M, G, A, O.
3) Approved Products. See Section 01 6200.
a) Dow Corning:

(1) Primer: 1200 Prime Coat.
(2) Sealant: 890-SL Silicone Building Sealant.
b) Sika:
(1) Primer: Primer: Sikasil Primer-2100.
(2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.

8. Sealants At Curbs And Gutters:
a. Expansion Joints and Control Joints:
1) Description:
a) Effective for sealing transverse contraction and expansion joints, longitudinal, center line and shoulder joints in Portland cement concrete.
b) One component (part) non-sag silicone material that cures to low modulus, silicone rubber upon exposure to atmospheric moisture. May be applied over wide temperature range.
2) Design Criteria:
a) Expansion joint sealant is required in following areas:
(1) Within curbs and gutters at approved layout locations.
b) Meet following standards for Sealant: Non-sag: ASTM C920: Type S, Grade NS, Class 100/50, Use T, NT.
3) Approved Products. See Section 01 6200.
a) Dow Corning:
(1) Primer: 1200 Prime Coat.
(2) Sealant: 888 Silicone Joint Sealant.
b) Sika:
(1) Primer: Primer: Sikasil Primer-2100.
(2) Sikasil-728 NS Non-Sag Silicone Sealant.

9. Sealants At Concrete Paving:
a. Expansion Joints and Control Joints (as required in Section 32 1313):
1) Description:
a) One component (part) self-leveling silicon material that cures to ultra-low modulus silicone rubber upon exposure to atmospheric moisture.
b) Cured silicone rubber remains flexible over entire temperature range expected in pavement applications.
2) Design Criteria:
a) Sealant is required at approved layout locations.
b) Meet following standards for Sealant: Self-leveling: ASTM C-920, Type S, Grade P, Class 100/50; Use T.
3) Approved Products. See Section 01 6200.
a) Dow Corning:
(1) Primer: 1200 Prime Coat.
(2) Sealant: 890-SL Silicone Building Sealant.
b) Sika:
(1) Primer: Primer: Sikasil Primer-2100.
(2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.

10. General Interior Sealants:
a. General:
1) Inside jambs and heads of exterior door frames.
2) Both sides of interior door frames.
3) Inside perimeters of windows.
4) Miscellaneous gaps between substrates.
b. Design Criteria:
1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
2) 100 percent silicone sealant.
c. Non-Paintable Sealant (Installer Option A):
1) Approved Product. See Section 01 6200.
a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
b) Laticrete: Latasil Silicone Sealant.
c) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2800 SilGlaze II Silicone Sealant.
d) Sherwin Williams: White Lightning Silicone Ultra Low Odor Window and Door Sealant.

e) Tremco: Tremsil 200 Silicone Sealant.
f) Franklin International: Titebond 2601 (White) 2611 (Clear) 100% Silicone Sealant.

d. Paintable Sealant (Installer Option B):
1) Approved Product. See Section 01 6200.
a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.

11. Sealants For Interior Joints:
a. General:
1) Countertops and backsplash to wall.
2) Sinks and lavatories to countertops.
3) Joints between plumbing fixtures and other substrates.
b. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
1) Ceramic tile inside corners.
2) Ceramic tile and paver tile joints.
c. Description:
1) One-part acetoxy cure silicone sealant with fungicides to resist mold and mildew.
d. Design Criteria:
1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
2) 100 percent silicone sealant.
e. Color: As selected by Architect from Manufacturer's standard colors.
f. Approved Products. See Section 01 6200.
1) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
2) Laticrete: Latasil Tile and Stone Silicone Sealant.
3) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS1700 Sanitary Silicone Sealant.
4) Tremco: Tremsil 200 Silicone Sealant.

2.2 ACCESSORIES

A. Bond Breaker Tape:
1. Pressure sensitive tape as by Sealant Manufacturer to suit application.
2. Provide tape to prevent adhesion to joint fillers or joint surfaces at back of joint and allow sealant movement.

B. Joint Backing:
1. Comply with ASTM C1330.
2. Flexible closed cell, non-gassing polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
3. Oversized 25 to 50 percent larger than joint width.

C. Joint Cleaner:
1. Non-corrosive and non-staining type as recommended by Sealant Manufacturer, compatible with joint forming materials.

D. Masking Tape:
1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Examine substrate surfaces and joint openings are ready to receive Work.
a. Verify each sealant is compatible for use with joint substrates.
b. Verify joint surfaces are clean and dry.
c. Ensure concrete surfaces are fully cured.

2. Sealants provided shall meet Manufacturer's shelf-life requirements.
3. Notify Architect of unsuitable conditions in writing.
   a. Do not proceed until unsatisfactory conditions are corrected.
4. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

A. Surface Preparation:
   1. Surfaces shall be clean, dry, free of dust, oil, grease, dew, frost or incompatible sealers, paints or coatings that may interfere with adhesion. Prepare substrates in accordance with Manufacturer's instructions:
      a. Porous surfaces: Clean by mechanical methods to expose sound surface free of contamination and laitance followed by blasting with oil-free compressed air.
      b. Nonporous surfaces: Use two-cloth solvent wipe in accordance with ASTM C1193. Allow solvent to evaporate prior to sealant application.
      c. High-pressure water cleaning: Exercise care that water does not enter through failed joints.
      d. Primers:
         1) Primers enhance adhesion ability.
         2) Use of primers is not a substitution for poor joint preparation.
         3) Primers should be used always in horizontal application where there is ponding water.
   2. Field test joints in inconspicuous location.
      a. Verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
      b. When test indicates sealant adhesion failure, modify joint preparation primer, or both and retest until joint passes sealant adhesion test.
   3. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.

B. Joints:
   1. Prepare joints in accordance with ASTM C1193.
      a. Clean joint surfaces of contaminates capable of affecting sealant bond to joint surface using Manufacturer's recommended instructions for joint preparation methods.
      b. Remove dirt, dust, oils, wax, paints, and contamination capable of affecting primer and sealant bond.
      c. Clean concrete joint surfaces to remove curing agents and form release agents.

C. Protection:
   1. Protect elements surrounding the Work of this section from damage or disfiguration.

3.3 APPLICATION

A. General:
   1. Apply silicone sealant in accordance with Manufacturer's instructions.
   2. Do not use damaged or deteriorated materials.
   3. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions.
   4. Apply primer where required for sealant adhesion.
   5. Install sealants immediately after joint preparation.
   6. Do not use silicone sealant as per the following:
      a. Apply caulking/sealant at temperatures below 40 deg F (4 deg C).
      b. Below-grade applications.
      c. Brass and copper surfaces.
      d. Materials bleeding oils, plasticizers, and solvents.
      e. Structural glazing and adhesive.
      f. Surfaces to be immersed in water for prolonged time.

B. Joint Backing:
   1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.

2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.

C. Bond Breaker:
1. Install bond breaker where joint backing is not used or where backing is not feasible.
a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.

D. Sealant:
1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
2. Fill joint opening to full and proper configuration.
3. Apply in continuous operation.
4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
5. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.

E. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than 3/16 inch (5 mm) between painted or coated substrates.

3.4 TOLERANCES

A. Provide joint tolerances in accordance with Manufacturer's printed instructions.

3.5 FIELD QUALITY CONTROL

A. Adhesion Test (Installer Option to use adhesion test to determine if primer is required).
1. Perform adhesion tests in accordance with Manufacturer's instructions and ASTM C1193, Method A, Field-Applied Sealant joint Hand-Pull Tab:
a. Perform five (5) tests for first 1,000 linear feet (300 meters) of applied silicone sealant and one (1) test for each 1,000 linear feet (300 meters) seal thereafter or perform one (1) test per floor per building elevation minimum.
b. For sealants applied between dissimilar materials, test both sides of joints.
2. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
3. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

3.6 CLEANING

A. Remove masking tape and excess sealant.

B. Clean adjacent materials, which have been soiled, immediately (before setting) as recommended by Manufacturer.

C. Waste Management: Dispose of products in accordance with manufacturer's recommendation.

END OF SECTION

SECTION 07 9219

ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Quality of sealants to be used at perimeters of and penetrations through acoustically insulated walls and associated ceilings.

1.2 REFERENCES

A. Definitions:
1. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed. With technology advancements both sealants and adhesives can be used interchangeably depending on the applications performance requirements.
2. Sealant Types and Classes:
a. Federal Specifications:
1) Type I: Self-leveling, pour grade.
2) Type II: Non-sag, gun grade.
3) Type NS: Non-sag, gun grade.
4) Class A: +25 percent, -25 percent expansion – contraction.
b. ASTM Specifications:
1) Type S: Single-component sealant.
2) Type M: Multi-component sealant.
3) Grade P: Pourable or self-leveling sealant for joints on horizontal surfaces.
4) Grade NS: Non-sag or gunnable sealant for joints in vertical surfaces.
5) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
6) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
7) T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
8) NT: Sealant designed for use in joints in non-traffic areas.
9) M: Sealant will remain adhered to mortar.
10) G: Sealant will remain adhered to glass.
11) A: Sealant will remain adhered to aluminum.
12) O: Sealant will remain adhered to substrates other than glass, aluminum, mortar.

B. Reference Standards:
1. ASTM International:
a. ASTM C834-17, ‘Standard Specification for Latex Sealants’.
b. ASTM C919-18, 'Standard Practice for Use of Sealants in Acoustical Applications'.
c. ASTM C1193-16, ‘Standard Guide for Use of Joint Sealants'.
d. ASTM E84-18b, ‘Standard Test Method for Surface Burning Characteristics of Building Materials’.
e. ASTM E90-09(2016), ‘Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements’.
2. Underwriters Laboratories, Inc.:

a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th edition - 2018)'

1.3 SUBMITTALS

A. Action Submittals:
1. Product Data:
a. Manufacturer's literature for each Product.

B. Informational Submittals:
1. Certificates:
a. Manufacturer's Certificate:
1) Certify products are suitable for intended use and products meet or exceed specified requirements.
2) Certificate from Manufacturer indicating date of manufacture.
2. Manufacturers' Instructions:
a. Manufacturer's installation recommendations for each Product.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Surface-Burning Characteristics:
a. Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
1) Class A (Flame spread index 0-25; Smoke-developed index 0-450).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Deliver and keep in original containers until ready for use.
2. Inspect for damage or deteriorated materials.

B. Storage And Handling Requirements:
1. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
2. Store in cool, dry location, and at temperatures never under 40 deg F (4 deg C) nor exceeding 80 deg F (26.7 C).

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Do not apply caulking at temperatures below 40 deg F (4 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sealants:
1. Design Criteria:
a. Meet requirements of ASTM C834.
b. Meet Class A flame spread rating.
2. Approved Products. See Section 01 6200.
a. OSI Pro-Series SC-175 Draft & Acoustical Sound Sealant by OSI Sealants Inc, Mentor, OH www.osisealants.com.
b. QuietZone Acoustic Caulk by Owens Corning, Toledo, OH www.owenscorning.com.

c. Acoustical Sealant by Tremco, Beachwood, OH www.tremcosealants.com
d. Acoustical Sound Sealant by Titebond.
e. Acoustical Sealant by U S Gypsum, Chicago, IL www.usg.com.

2.2 ACCESSORIES

A. Bond Breaker: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.

B. Joint Backing:
1. Flexible closed cell polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
2. Oversized 25 to 50 percent larger than joint width.

C. Joint Cleaner: Non-corrosive and non-staining type, recommended by Sealant Manufacturer, compatible with joint forming materials.

D. Masking Tape: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.

E. Primer: Non-staining type, type, recommended by Sealant Manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Examine substrate surfaces and joint openings are ready to receive Work.
2. Sealants provided shall meet Manufacturer's shelf-life requirements.
3. Notify Architect of unsuitable conditions in writing.
a. Do not proceed until unsatisfactory conditions are corrected.
4. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

A. Surface Preparation:
1. Prepare joints in accordance with ASTM C1193 and Manufacturer's instructions.
2. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
3. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

B. Surface Preparation:
1. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.
2. Surfaces shall be clean, dry, and free of dust, oil, grease, dew, or frost.

3.3 INSTALLATION

A. General:
1. Do not use damaged or deteriorated materials.
2. Install primer and sealants in accordance with ASTM C1193 and Manufacturer’s instructions where required for sealant adhesion.
3. Install sealants immediately after joint preparation.
4. Do not apply caulking/sealant at temperatures below 40 deg F (4 deg C).

B. Joint Backing:
   1. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.
   2. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.

C. Install at perimeter joints and mechanical and electrical penetrations in sound insulated rooms. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint.

D. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.

E. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.

3.4 FIELD QUALITY CONTROL

A. Inspection:
   1. Examine sealant joints to verify compliance with Contract Document requirements.

B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Sealant material found to be contaminated or damaged or inadequate preparation of substrate results in deficiencies in joint sealant adhesion is considered defective or not complying with Contract Document requirements.
   2. Correct any work found defective or not-complying with Contract Document requirements at no additional cost to Owner.

3.5 CLEANING

A. General:
   1. Remove sealant from adjacent surfaces in accordance with Sealant Manufacturer and Substrate Manufacturer recommendations as work progresses.
   2. Remove masking tape and any other foreign material.
   3. Clean adjacent materials that have been soiled immediately (before setting) as recommended by Manufacturer.

B. Waste Management: Dispose of products in accordance with Sealant Manufacturer's recommendation.

END OF SECTION

08 12112

PREFINISHED STEEL FRAMES

Part 1 - GENERAL

1.01 Work Included

A. The work under this section shall include the furnishing of all items shown on the drawings and as specified, including but not limited to, the following:

1. Knocked down, site assembled prefinished steel door frames
2. Knocked down, site assembled sidelight, borrowed light, transom, and fullbound access door frames

1.02 Related Sections

A. Section 01 31 00 – Coordination, Site meetings

B. Section 08 1213 – Hollow Metal Frames

C. Section 08 1313 – Hollow Metal Doors

D. Section 08 1429 – Flush Wood Doors

E. Section 08 7100 - Hardware

F. Section 08 8100 – Glass Glazing

1.03 References

A. ASTM A653 – Standard for hot dipped galvanized steel material

B. UBC 7-2-97, UBC 7-4-97 Positive Pressure Fire Test Certification

C. UL 10B Fire test of Door Assemblies and UL10C Standard for Positive Pressure Fire Tests of Door Assemblies

D. NFPA 80 - Fire Doors and Windows (Latest Edition)

E. NFPA-101 - Life Safety Codes (Latest Edition)

F. ASTM D2197 - Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.

G. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

H. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

I. ASTM D3361 - Standard Practice for Unfiltered Open-Flame Carbon-Arc exposures of Paint and Related Coatings.

J. ASTM B117 – Standard test for salt spray testing

1.04 Submittals

A. Section 01 3300: Submittal procedures.

B. Product Data: Indicate frame material, Gauge, configuration and finishes.

C. Shop Drawings: Indicate frame elevations, details of frame anchorage, reinforcements required, rough opening requirements, location of hardware embosses, and finishes. Detail each floor of the building separately.

D. Samples: Submit 3 standard frame samples, illustrating factory finished frame colors.

E. Manufacturer's Installation Instructions: Provide installation instructions for all products under this section.

F. Manufacturer's Certificate of Warranty: Provide manufacturer's standard warranty certificate stating material is warranted for a period of one year from date of building occupancy

1.05 Quality Assurance

A. Quality Standards

1. Material free from defects in material and according to project specifications for pre-engineered opening systems

2. Proven durability of factory finishes allowing for bending and shaping of material after finish is applied

B. Fire Rated Frame Construction

1. Conform to ASTM E152, NFPA 252, UL 10B and 10C.

C. Installed Frame Assembly: Conform to NFPA 80

1. Use only installers familiar with installation of prefinished opening systems and applied casing frame installation

1.06 Delivery, Storage and Handling

A. Transport, handle, store, and protect products in a dry area off the ground.

B. Accept frames on site in manufacturer's box packaging with identification labels intact. Inspect for damage.

C. Do not open individual boxes until installation is to begin.

Part 2 - PRODUCTS

2.01 Acceptable Manufacturers

A. Timely Industries, A Division of SDS Industries, Inc., 10241 Norris Avenue, Pacoima, CA, 91331-2292; Phone toll free: 800-247-6242; Fax: 818-492-3530.

Web site: www.timelyframes.com.

B. Frames: Provide all interior frames for project from same manufacturer. Provide exterior frames as shown on plans

2.02 Frames

A. Frame Material: Hot dipped galvanized steel, for interior frames in normal atmospheric exposures.

B. Frame Material: Hot dipped galvanized steel for all frames used in the following locations:

1. Exterior Locations

2. Public and Private Restrooms

3. Coastal locations for both interior and exterior applications exposed to salt air or salt spray within 10 miles of any ocean or salt water lake

C. Frame Throat Opening: As shown on plan details to suit finished wall thickness.

D. Fire rated frames and Office Entry frames to be CK series with kerf formed into frame profile with factory installed, pre-mitered smoke/sound control gasket

E. Frame Profile - Unequal Rabbet profile, standard with manufacturer

1. "S" Series, 0.9 mm (20 Gauge) thick, interior office spaces
2. "C" Series, 1.2 mm (18 Gauge) thick, other areas, non standard jamb depths
3. "CK" Series, 1.2 mm (18 Gauge) thick, with kerf for door seal/gasket

4. “E” Series 0.9 mm (20 Gauge) thick
    a. #430 Bright Polished Stainless Steel
    b. #304 Brushed Stainless Steel
    c. Polished Brass, Brass Base metal (Cannot be fire rated)
    d. Polished Brass, Steel Base metal (Can be fire rated)
5. “P” Series, 1.2 mm (18 Gauge) thick, trim frames for pocket doors

F. Side Light Frames: 1.2 mm (18 Gauge) Verify glass dimensions for fire rated sidelights and borrowed lights

G. Casings

1. Provide steel or aluminum casings formed to be applied to heat treated clips on frame face after frame is anchored to wall

2. Standard Steel - TA-8 with 6 mm (1/4 inch) reveal, on steel, stainless steel, and/or brass frames. Fit factory assembled units with MiterGard corner alignment clips.

2.03 Frame Reinforcement and Accessories

A. Provide reinforcements shipped loose to project site for hardware application

1. TA-10 - Regular arm closers, casing mounted coordinators

2. TA-12 - Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware

3. TA-47 – For CK frame, Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware

4. TA-25 - Double acting spring hinges, continuous hinges, other surface mounted hardware on door rabbet or cased opening frame

5. Provide hinge reinforcement (TA-11) of 14 Gauge steel pierced to create depth of thread for hinge screws equal to or exceeding 7 Gauge steel.

B. Weatherstrip/Smoke Gasket: TA-46 (QDS500) 90 minute rated gasket for kerfed frames. All pieces factory mitered to assure perfect corner alignment. Select color: Browntone, Black, Western White, Off White, Grey, Beige (custom colors not available)

C. Silencers: TA-5 vinyl, 2 per frame, clear stick-on type. Silencers not required on Kerfed frames or frames scheduled to receive stop mounted gasket or weatherstrip

D. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punch and countersink for flat head tek screws.

E. Adjustable strikes: Emboss frames for TA-1 strike for cylindrical lock. Provide TA-1 strike in finish compatible with hardware finish. (ANSI 2 ¾” T strike supplied with cylindrical lock cannot be used with standard frame because of unique strike location and screw piercing method)

F. Prepare frames for ASA 4-7/8” strikes where required. Provide minimum ¼” depth of threads in factory tapped screw holes

G. Installation fasteners (Provided by others)

1. Interior Frames: #6 Drywall type length sufficient to penetrate studs or structure at least ½”.

2. Exterior Frames: Drywall type, corrosion resistant coating, same as G.1 above

2.04 Fabrication

A. Openings for single swing, pair, borrowed light and sidelight frames to be pre- cut, notched and fabricated at the manufacturer's facility. For fire rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip

B. Provide minimum 14 Gauge hinge reinforcement plate tapped for machine screws supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame

C. Casing Clips: Fabricate frames with factory applied, heat treated clips to ensure no deflection in the clip upon application or removal of casing. Attachment clips may not be of same material as frame

D. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners

E. Mullions to be notched as required to provide tight joints

F. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts

G. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2" of each end of stop piece

H. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.

I. Provide adequate structural support (by others) for ceiling insert channel for ceiling height frames

J. Transom bars to be fixed type with compatible profiles to jamb and head

K. Attach approved mylar label to each fire-rated frame indicating fire rating details

L. Factory install TA-46 smoke gasket on all prefinished, CK series frames. Install with factory mitered corners to ensure adequate seal and pleasing appearance.

2.05 Finishing

A. Frame Units: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system

B. Frames for high humidity areas to be hot dipped galvanized. See 2.02.B for specific locations

C. Casing Finishes

1. Steel: Prefinished with factory applied impact resistant, polyurethane baked enamel finish.

D. Colors:

1. Standard Colors: Driftwood (CC501)

Part 3 – EXECUTION

3.01 Examination

A. Verify acceptability of existing conditions before starting work.

B. Verify that opening sizes and wall thicknesses are within specified tolerances. Verify that all finished walls are in plane to ensure proper door alignment.

3.02 Installation

A. Install frames in accordance with manufacturer's requirements.

B. Anchor frames with screws located at every casing clip or every 11" as shown on manufacturer's instructions. Field verify quantity and location of fasteners prior to installing casing.

C. Install prefinished frames near end of the project after wall painting and wall coverings are applied.

D. Install frames using qualified installers familiar with installation of prefinished drywall frames.

E. Coordinate installation of glass and glazing in glazed units.

F. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors.

G. Touch-up blemishes on finished frames with factory prepared touch up paint.

END OF SECTION

SECTION 08 1213

HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Hollow metal frames.

B. Related Requirements:
   1. Section 05 1223: 'Structural Steel For Buildings' for channel frames.
   2. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
   3. hardware.
   4. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for aluminum entry frames.

1.2 REFERENCES

A. Reference Standards:
   1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
      a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
   2. ASTM International:
      a. ASTM A568/A568M-13a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
      b. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
   3. Steel Door Institute:
      a. SDI A250.8-2003(R2008), 'Standard Steel Doors and Frames'.
      b. SDI A250.11-2012, 'Recommended Erection Instructions for Steel Frames'.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Copy of SDI A250.11.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Suppliers:
   1. Category One Approved VMR Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
      a. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
         1) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
      b. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
         1) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.

B. Manufacturers:

1. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories.
   a. Any current member of Steel Door Institute.

C. Frames:
   1. Cold rolled furniture steel.
      a. Interior Frames: 16 ga. (1.6 mm).
      b. Exterior Frames: 14 ga. (1.9 mm).
   2. Provide labeled frame to match fire rating of door.
   3. Finish:
      a. Use one of following systems:
         1) Prime surfaces with rust inhibiting primer.
         2) Galvanize.
   4. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.

D. Fabrication:
   1. General Requirements:
      a. Frames shall be welded units. Provide temporary spreader on each welded frame.
      b. Provide Manufacturer's gauge label for each item.
      c. Make breaks, arrises, and angles uniform, straight, and true. Accurately fit corners.
   2. Frame width dimension:
      a. Fabricate frame 1/8 inch (3 mm) wider than finished wall thickness as described in Contract Documents.
   3. Provide mortar guards at strikes and hinges.
   4. Anchors:
      a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.
      b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
      c. Anchor types and configurations shall meet wall conditions.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 1313

HOLLOW METAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Hollow metal doors.

B. Related Requirements:
   1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for door installation.
   2. Section 08 7105: 'Accessories For Pairs Of Doors' for astragals.
   3. Section 08 8100: 'Glass Glazing' for quality of glass glazing.

1.2 REFERENCES

A. Association Publications:

B. Reference Standards:
   1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
      a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
   2. ASTM International:
      a. ASTM A568/A568M-15, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
      b. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
      c. ASTM C1036-16, 'Standard Specification for Flat Glass'.
      d. ASTM C1048-12e, 'Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass'.
   3. Steel Door Institute:
      a. SDI A250.8-2003(R2008), 'Standard Steel Doors and Frames'.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Suppliers:
   1. Category One Approved VMR Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
      a. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
         1) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
      b. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
         1) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.

B. Manufacturers:
   1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      a. Any current member of Steel Door Institute.

C. Doors:
    1. Meet one of following requirements:
        a. Meet requirements of Steel Door Institute ANSI / SDI A250.8.
        b. Commercial grade steel meeting requirements of ASTM A568/A568M, Class 1:
            1) Grade II for interior doors, Grade III for exterior doors.
            2) Model 1 Full Flush or Model 2 Seamless designs at Manufacturer's option.
            3) Type F and G as required.
            4) Finish:
                a) Interior doors primed or galvanized as per ASTM A653/A653M.
                b) Exterior doors galvanized and primed as per ASTM A653/A653M.
    2. Factory Glazing:
        a. Narrow Light:
            1) Glazing (non-fire-rated openings):
                a) Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3.
                b) Thickness 1/4 inch (6 mm).

D. Fabrication:
    1. General:
        a. Mortise and reinforce doors for hinges and locks.
        b. Reinforce doors for closers and other surface applied hardware.
        c. Drill and tap on job.
        d. Seams along vertical edges of door need not be filled.
        e. Do not extend hinge cut out full width of door unless fill strip is inserted, weld filled, and ground smooth so no seam appears on back face plate.
        f. Double doors shall have overlapping rolled steel astragal.

2.2 SOURCE QUALITY CONTROL

A. Tests:
    1. Verification of Performance:
        a. Label each door as conforming to above required standards.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 1429

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished but Not Installed Under This Section:
   1. Factory-finished flush wood doors.

B. Related Requirements:
   1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
   2. Section 06 4005: 'Plastic Laminate' for door finish.

1.2 REFERENCES

A. Abbreviations And Acronyms:
   1. AWS: Architectural Woodwork Standards (formerly AWI).
   2. FD: Fire-resistant core, fire-resistant materials assembled to stiles and rails according to methods prescribed by the testing agency to meet rigorous smoke, flame, and pressure tests.
   3. FD-5: Core with 2 layers on each side.
   4. ME: Matching edges, i.e., vertical edges same as decorative faces.
   5. PC: Particleboard core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces.
   6. PC-5: Core with 2 layers on each side.

B. Association Publications:
   1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
      a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.

C. Definitions:
   1. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
   2. Fire-rated: Fire-retardant particleboard with an Underwriters' Laboratory (UL) stamp for Class 1 fire rating (Flame Spread 20, Smoke Developed 25). Fire-rated doors are available with particleboard and mineral cores for ratings up to 1-1/2 hours.
   3. Fire-rated Door: A door made of fire-resistant material that can be closed to prevent the spread of fire and can be rated as resisting fire for 20 minutes (1/3 hour), 30 minutes (1/2 hour), 45 minutes (3/4 hour) (C), 1 hour (B), or 1-1/2 hours (B). The door must be tested and carry an identifying label from a qualified testing and inspection agency.
   4. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
      a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
      b. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.
   5. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.

D. Reference Standards:

1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
   a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
2. ASTM International:
   a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
   b. ASTM C1048-12, 'Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass'.
3. Hardwood, Plywood, and Veneer Association:
   a. HPVA HP-1-2009 'Standard for Hardwood and Decorative Plywood'.
4. National Particleboard Association / Composite Panel Association:
   a. NPA A208.1-2009, 'Particleboard'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
      b. Indicate factory finish color and type.
   2. Samples:
      a. Interior Hardwood with Plastic Laminate Finish:
         1) Approval:
            a) Prepare sample with plastic laminate finish as specified in Section 06 4005.
         2) Design Criteria:
            a) Provide 8 inch by 10 inch (200 mm by 255 mm) sample for door core with finish.

B. Closeout Submittals:
   1. Include following information in Operations And Maintenance Manuals specified in Section 01 7823:
      a. Record Documentation:
         1) Manufacturers Documentation:
            a) Manufacturer's product literature on doors and finish.
            b) Maintenance and repair instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver in clean truck and, in wet weather, under cover.
   2. Deliver to building site only after plaster, cement, and taping compound are completed and dry and after interior painting operations have been completed.
   3. Individually wrap in polyethylene bags for shipment and storage.

B. Storage And Handling Requirements:
   1. Store doors in a space having controlled temperature and humidity range between 25 and 55 percent.
   2. Store flat on level surface in dry, well ventilated space.
   3. Cover to keep clean but allow air circulation.
   4. Do not subject doors to direct sunlight, abnormal heat, dryness, or humidity.
   5. Handle with clean gloves and do not drag doors across one another or across other surfaces.
   6. Leave shipping bag on door after installation until immediately before substantial completion inspection.
   7. Doors have been acclimated to the field conditions for a minimum of 72 hours before installation is commenced.

1.5 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's standard full door warranty for lifetime of original installation.
      a. Warranty shall include finishing, hanging, and installing hardware if manufacturing defect was discovered after door was finished and installed.
      b. Warranty to include defects in materials including following:
         1) Delaminating in any degree.
         2) Warp or twist of 1/4 inch (6 mm) or more in door panel at time of one-year warranty inspection.
         3) Telegraphing of core assembly: Variation of 1/100 inch (0.25 mm) or more in 3 inch (75 mm) span.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers:
   1. Approved Manufacturers:
      a. Graham Wood Doors, Mason City, IA.
      b. Marshfield Door Systems Inc, Marshfield, WI.
      c. VT Industries, Holstein, IA.

B. Wood Doors:
   1. Type: AWS PC-5ME or FD-5ME.
   2. Grade: AWS Premium, except face veneer.
   3. Fully Type I Construction: Adhere all glue lines with Type I adhesive, including veneer lay-up.
   4. Face Finish:
      a. Per Section 06 4005 'Plastic Laminate'
      b. Face finish shall be running book matched.
   5. Core:
      a. Fully bonded to stiles and rails and sanded as a unit before applying plastic laminate finish.
      b. Non-Rated:
         1) 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
         2) Stiles:
            a) 1-3/8 inches (35 mm) deep minimum before fitting.
            b) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
         3) Rails:
            a) 1-1/8 inches (28 mm).
            b) Manufacturer's option.
   6. Factory Glazing (non-fire-rated openings):
      a. Glazing: Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3. Thickness 1/4 inch (6 mm).
      b. Lite Kit:

C. Fabrication:
   1. Doors shall be factory-machined. Coordinate Sections under 08 7100.

D. Finishes:
   1. Factory Finishing:
      a. Applied by Door Manufacturer before leaving factory.
      b. Performance / Design Criteria:
         1) Plastic laminate finish as specified in section 06 4005 applied to door core faces and edges with routed edge finish.

2.2 SOURCE QUALITY CONTROL

A. Inspections:
   1. Verification of Performance:
      a. Doors shall have following information permanently affixed on top of door:
         1) Manufacturer:
         2) Door designation or model.
         3) Veneer finish.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 1613

FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass Entrance Door Systems:
   1. Fiberglass doors.
   2. Fiberglass doors.

1.2 RELATED SECTIONS

A. Section 04 2200 – Concrete Unit Masonry.

B. Section 05 4000 - Cold-Formed Metal Framing.

C. Section 06 1000 - Rough Carpentry.

D. Section 08 7100 – Hardware Groups.

E. Section 09 9001 – Common Painting and Coating Requirements.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM E413 - Classification for Rating Sound Insulation.
   2. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.

B. National Fire Protection Association (NFPA):
   1. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

C. Underwriters Laboratories (UL):
   1. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Manufacturer's data sheets for each product to be used including but not limited to the following.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Typical installation methods.
   4. Factory finishing information.
   5. Core and edge construction.
   6. Trim for openings.

C. Shop Drawings: Submit shop drawings showing relationship with adjacent construction, layout, profiles, product components and accessories.
   1. Indicate door type, frame, steel, core, material thickness, reinforcements, anchorages, exposed fasteners locations, glazed, paneled or louvered openings and hardware arrangement.
   2. Indicate location, size, and hand of each door; elevation of each kind of door;

construction details not covered in product data.

D. Verification Samples: Two representative units of each finish, texture and color.

E. Test Reports: Submit for doors, indicating compliance with referenced standards.

F. Operation and Maintenance Data: For each product installed including but not limited to methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum 10 years documented experience whose products have been in satisfactory use in similar service for not less than 10 years.

B. Source Limitations: Obtain each type of fiberglass door through one source from a single manufacturer.

C. Fire-Rated Doors: Provide doors that are listed and labeled by Warnock Hersey, for 20 minute fire-protection rating.
1. Testing: NFPA 252.
2. Testing: UL Standard 10C.
3. Testing: As scheduled and indicated on Drawings.

D. Regulatory Requirements for Labeled Door and Frame Construction: Where noted or required, provide Warnock Hersey Inc. (WHI) labels (Intertek Services) with appropriate fire resistance ratings for class of opening indicated. Construction details and hardware applications authorized by testing or certification laboratories shall take precedence over project details or specifications.

E. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Do not proceed with remaining work until workmanship is approved by Architect.
4. Retain mock-up during construction as a standard for comparison with completed work.
5. Maintenance: Maintain mock-up during construction for workmanship
6. comparison; remove and legally dispose of mock-up if it is no longer required.
7. Do not alter or remove mock-up until work is completed or removal is authorized.
8. At Substantial Completion, approved mockups may become part of completed Work.
9. Demolish mockups and remove from site.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work of this Section.
1. Attendees shall include Architect, Contractor and trades involved.
2. Agenda shall include verification of project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, schedule, responsibilities, critical path items and approvals.

B. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
   1. Store materials protected from construction operations and exposure to harmful weather conditions, at humidity and temperature conditions recommended by manufacturer
   2. Package doors on pallets and protect with cardboard top and bottom, corner protectors, banding, and shrink wrap.
   3. Protect at corners to prevent damage or marring of finish.
   4. Leave product wrapped or otherwise protected and under clean, dry storage conditions until required.
   5. Store doors and frames in an upright position under cover on building site on wood sills or on floors in a manner that will prevent rust and damage.
   6. Avoid creating a humidity chamber by using a plastic or canvas shelter and not venting the area covered.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard limited warranty that products will be free of manufacturing defects in materials or workmanship:
   1. Doors: 25 years.
   2. Doors Limited lifetime warranty.
   3. Glass Vision Panels: 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: CORRIM Company, Oshkosh, Wisconsin 54901. Phone (920) 231-2000 – www.corrim.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with the provisions of Section 01 6000 - Product Requirements.

2.2 FIBERGLASS DOORS

A. Acoustical Performance: Opaque doors.
   1. Compliance: ASTM E413.
   2. Sound Transmission Class (STC) Rating: 25.

B. Construction:
   1. Door Skins: High impact compression molded fiberglass reinforced material.
   2. Top Rails: Composite material.
   3. Bottom Rails: Composite material, accommodating a range of door sweeps.
   4. Door Sweeps: Manufacturer's standard fiberglass pound on finned sweep.
   5. Stiles: No lock block required.

a. Materials: Hardwood capped laminated strand lumber (LSL).
b. Width: 4 inches (102 mm), both sides of door.

6. Cores: 100 percent CFC-free polyurethane insulation.
7. Door Lites:
   a. High impact compression molded fiberglass reinforced material.
   b. Screw together with plugs to cover screws on inside of door.
8. Glazing Lites: As scheduled and indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If substrate preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

D. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved submittals.
   1. Install door frames level, plumb, true, and in proper relationship with adjacent materials.
   2. Use concealed shims where necessary for alignment.
   3. Hardware: Refer to Division 8 section for hardware.

3.3 TESTING AND ADJUSTING

A. Factory Finished Doors:
   1. Replace doors that are damaged or do not comply with requirements.
   2. Repair or refinish doors if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust hinge sets, locksets and other hardware as recommended by manufacturer. Rehang or replace doors that do not swing or operate freely.

C. Lubricate using a manufacturer recommended lubricant compatible with door and frame coatings.

3.4 CLEANING AND PROTECTION

A. Clean installed products in accordance with manufacturer's recommendations prior to Substantial Completion.

B. Remove temporary coverings and protection of adjacent work areas. Remove construction debris from project site and legally dispose of debris.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 08 3110

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Manufactured access doors.

B. Related Requirements:
   1. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Acceptable Manufacturers:
   1. Babcock-Davis, Minneapolis, MN www.babcock-davis.com.
   2. The Bilco Company, New Haven, CT www.bilco.com
   3. Dur-Red Products, Cudahy, CA www.dur-red.com.
   4. Elmdor Stoneman, City of Industry, CA www.elmdorstoneman.com.
   5. Jensen Industries, Los Angeles, CA www.jensen-ind.com.
   6. Karp Associates Inc, Maspeth, NY www.karpinc.com.
   7. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
   8. Mifab Manufacturing Co, Minneapolis, MN www.mifab.com.
   9. Milcor, Bensenville, IL www.milcorinc.com.
   10. Nystrom Inc, Brooklyn Park, MN www.nystrom.com.
   11. Williams Brothers Corporation of America, Reno, NV www.wbdoors.com.
   12. Equal as approved by Architect before bidding. See Section 01 6200.

B. Standard Ceiling or Wall Access Doors:
   1. Manually operated with single key operated lock, interior latch release, and continuous piano hinge hardware.
   2. Factory powder-coated prime finish.
   3. Non-Fire-Rated Insulated, Quality Standard:
      a. KRP-150 FR or KRP-350.FR by Karp.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 3323

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
   1. Furnish and install overhead electric operated coiling insulated rolling doors as described in Contract Documents.

B. Products Furnished but Not Installed Under This Section:
   1. Anchors and inserts to be installed in masonry.

C. Related Requirements:
   1. Division 26: 'Electrical' for electrical wiring and conduit, fuses, disconnect switches, and connection of operator to power supply.

1.2 REFERENCES

A. Reference Standards:
   1. American Society of Civil Engineers:
      a. ASCE 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
   2. ASTM International:
      a. ASTM A653/A653M-15, ‘Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process’.
      b. ASTM E84-16, ‘Standard Test Method for Surface Burning Characteristics of Building Materials'.
      c. ASTM E90-09(2016), ‘Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements’.
   3. California Building Code (CBC):
      a. Chapter 16, 'Structural Design':
         1) 1609 'Wind Loads'.
            a) 1609.3, 'Basic Wind Speed'.
      b. Chapter 16, 'Structural Design'. (2016 CBC Code):
         1) Section 1609 'Wind Loads'.
            a) 1609.3, 'Ultimate Design Wind Speed'.
   4. Underwriters Laboratories, Inc.:
      a. UL 723: ‘Tests for Surface Burning Characteristics of Building Materials’ (10th Edition).

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's standard color chart for Architect's color selection.
   2. Shop Drawings:
      a. Show special components and installations that are not fully dimensioned or detailed on Manufacturer's data sheets.

B. Informational Submittals:
   1. Test and Evaluation Reports: Submit evidence that overhead coiling doors has been tested and approved or listed as follows:
      a. Submit evidence that doors has been tested to meet UL Class requirement required for fire-resistance rating for this Project.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Manufacturer’s documentation:
a) Manufacturer's product data and color selection.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Fire-Test Response Characteristics: As determined by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
a. Surface-Burning Characteristics:
1) Overhead Coiling Doors: Flame spread index of 0 and smoke developed index of 10 as tested per ASTM E84 or UL 723.

B. Qualifications:
1. Installers:
a. Approved by Manufacturer.

1.5 WARRANTY

A. Manufacturer's Warranty:
1. Provide Manufacturer's Warranty against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers:

1. Motor-Operated: Model ESD20 Thermiser Insulated Rolling Door by Cornell Cookson, Inc.: Doors located at Warehouse and Weld Shop buildings per plan.
2. Manually-Operated: Model EAG 10 Steel Weave Metal Mesh Rolling Grille Door by Cornell Cookson, Inc.: Doors located at Operation Office and Warehouse buildings counter areas per plan.

B. Description:
1. Insulated rolling doors designed for exterior openings where maintaining different temperatures on each side of door is desirable.
2. Full perimeter seal of doors.

C. Design Criteria:
1. Cycle Life:
a. Design doors of standard construction for normal use of up to 20 cycles per day maximum, and overall maximum of 50,000 operating cycles for life of door.
2. Seismic Performance:
a. Provide manufacturer's seismic calculations confirming ASCE7-10.
3. Insulated Door Slat Material Requirements:
a. Meet flame spread index requirements of Quality Assurance in Part 1 of this specification.
b. Sound Transmission Class requirements of Source Quality Control in Part 2 of this specification.
c. STC Rating: Up to 30 for the curtain and up to 22 for entire assembly, as tested per ASTM E90 and based on testing complete, operable assembly.
d. Minimum R-value of 8.0 (U-value of 0.125) as calculated using ASHRAE Handbook of Fundamentals.

e. Insulation to be CFC free with Ozone Depletion Potential (ODP) rating of zero.
f. Wind Loading:
1) Doors to withstand up to 20 psi (138 kPA design wind load.

D. Curtain:
1. Fabrication:
a. Slat Material:
1) Structural quality, cold-rolled galvanized steel sheets complying with ASTM A653 with 24/24 gauge, Grade 40 zinc coating and phosphate treated before fabrication.
2) Insulation: 7/8 inch (22 mm) foamed-in-place, close cell urethane.
3) Total Slat Thickness: 15/16 inch (24 mm).

E. Endlocks:
1. Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two (2) 1/4 inch (6.4 mm) rivets.
2. Provide windlocks as required to meet specified wind load.

F. Bottom Bar:
1. Insulated extruded aluminum bottom bar.

G. Guides:
1. Fabrication:
a. Minimum 3/16 inch (4.76 mm) structural steel angles:
1) Provide windlock bars of same material when windlocks are required to meet specified wind load.
2) Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides.
3) Provide removable guide stoppers to prevent over travel of curtain and bottom bar.
4) Top 16 1/2 inches (419.1 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.

H. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.030 inch per foot (0.76 mm per 305 meter) of width.
2. Spring Balance:
a. Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N).
b. Provide wheel for applying and adjusting spring torque.

I. Brackets:
1. Fabricate from minimum 3/16 inch (4.76 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.

J. Hoods:
1. Fabrication:
a. Form to entirely enclose coiled curtain and operating mechanism at opening head, and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
b. Fabricate steel hoods for doors of not less than 24 gauge (0.64 mm) hot-dip galvanized steel sheet with Grade 40 zinc coating, complying with ASTM A653. Phosphate treat before fabrication.

K. Weatherstripping:
1. Bottom Bar:
a. Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar.

b. Guides: Replaceable vinyl strip on guides sealing against both sides of curtain.
c. Hood: Neoprene/rayon baffle to impede air flow above coil.
d. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.

L. Operation:
1. Electric Door Operators:
a. Provide electric door operator assembly complete with 1/2 hp, 208 V, single phase heavy duty motor and factory-wired motor controls, gear head drive in oil bath, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.
b. Provide hand-operated disconnect or mechanism for automatically engaging sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engage.
c. Design operator so motor can be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
d. Provide wall or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and disconnect release for manual operation. Provide motor and drive assembly of horsepower and design as determined by Door Manufacturer for size of door required.
e. Electric Motor:
1) High-starting torque, reversible, constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position, at 8 inches (200 mm) minimum and 1 foot (300 mm) maximum per second.
2) Open-drip-proof type motor and controller with NEMA Type 1 enclosure.
f. Remote Control Station: Surface-mounted, Dust-proof and sealed, 3-button pushbutton stations. Interior units, full-guarded, heavy-duty, with general purpose NEMA Type 1B enclosure.
g. Automatic Reversing Control: Furnish each door with electrically actuated automatic bottom bar including automatic safety switch extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
h. Operator must not extend above or below door coil when mounted front-of-coil.
i. Rated for maximum of 20 cycles per hour (not to be used for consecutive hours) UL/ULC listed.
j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1) Model MG (Industrial Duty Gear Head) Operator by CornellCookson.
2. Hood:
a. Form to entirely enclosed Electrical Door Operator.
b. Provide intermediate support brackets as required to prevent sag.
c. Fabricate steel hoods for doors of not less than 24 gauge (0.64 mm) hot-dip galvanized steel sheet with Grade 40 zinc coating, complying with ASTM A653. Phosphate treat before fabrication.

M. Finish:
1. Powder-coat finish with custom color designated by Owner.
a. ASTM A653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
b. Phosphate treatment followed by baked-on polyester powder coat.
2. Finish for:
a. Brackets.
b. Bottom bar (Interior and exterior).
c. Guides.
d. Hoods.
e. Slats (Interior and exterior).
3. Color:
a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1) SpectraShield Coating System by CornellCookson.

a) Powder-coat finish with custom color designated by Owner.

4. Ferrous Metal and Galvanized Surfaces: Except fayed and lubricated surfaces, shop clean and prime with door Manufacturer's standard rust inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Examine substrate and verify that it is suitable for installation of overhead coiling doors.
   2. Notify Architect of unsuitable conditions in writing.
      a. Do not install over unsuitable conditions.
      b. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

A. Interface With Other Work:
   1. Interlock coiling door controls with dock leveler controls so coiling door will not close when dock leveler is raised, and dock leveler will not raise when coiling door is closed.

B. General:
   1. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
   2. Follow manufacturer's installation instructions.

C. Secure continuous wall angles to wall framing by 3/8 inch (9.5 mm) minimum bolts at not more than 30 inches (762 mm) on center, unless closer spacing recommended by Door Manufacturer. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
   1. Upon completion of the Work, lubricate, test, and adjust doors to operate easily, free from warp, twist, and distortion and fitting weather-tight for entire perimeter.
   2. Upon completion of the Work, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion, and fitting weather-tight for entire perimeter.

3.4 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Waste Management:
   1. Remove surplus materials and debris from the site.

3.5 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:
   1. Demonstrate proper operation of overhead coiling doors to Owner's Representative.
   2. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08 3600
SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazed Aluminum Sectional Overhead Doors

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.

C. Section 05500 - Metal Fabrications: Steel frame and supports.

D. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.

E. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

F. Section 08710 - Door Hardware: Cylinder locks.

G. Section 09900 - Paints and Coatings: Field painting.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
   1. Design pressure of 110 lb/sq ft.

B. Wiring Connections: Requirements for electrical characteristics.
   1. 230 volts, three phase, 60 Hz.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.

1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
    a. Panel Thickness: 1-3/4 inches (44 mm).
    b. Center Stile Width: 2-11/16 inches (68 mm)
    c. End Stile Width: 3-5/16 inches (84 mm)
    d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
    e. Top Rail Width:
        1) 2-3/8 inches (60 mm).
        2) 3-3/4 inches (95 mm).
    f. Bottom Rail Width:
        1) 3-3/4 inches (95 mm).
        2) 4-1/2 inches (114 mm).
    g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
    h. Stiles and Rails: 6063 - T6 aluminum.
    i. Springs:
        1) 50,000 cycles.
    j. Glazing:
        1) 1/4 inch (6 mm) Tempered glass.
2. Finish and Color:
    a. Anodized Finish: Clear anodized.
    b. Anodized Finish: Bronze anodized.
    c. Powder coat finish bronze light.
    d. Powder coat finish bronze medium.
    e. Powder coat finish bronze dark.
    f. Powder Coating Finish: Color as selected by Architect from manufacturer's standard colors.
3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock: Interior galvanized single unit.
6. Weatherstripping:
    a. Flexible bulb-type strip at bottom section.
    b. Flexible Jamb seals.
    c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
8. Manual Operation: Pull rope.
9. Manual Operation: Chain hoist.
10. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
    a. Entrapment Protection: Required for momentary contact, includes radio control operation.
        1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
        2) Electric sensing edge monitored to meet UL 325/2010.
        3) Photoelectric sensors monitored to meet UL 325/2010.
    b. Operator Controls:
        1) Push-button operated control stations with open, close, and stop buttons.
        2) Key operated control stations with open, close, and stop buttons.
        3) Push-button and key operated control stations with open, close, and stop buttons.
        4) Flush mounting.
        5) Surface mounting.
        6) Interior location.

7) Exterior location.
8) Both interior and exterior location.

c. Special Operation:
1) Pull switch.
2) Vehicle detector operation.
3) Radio control operation.
4) Card reader control.
5) Photocell operation.
6) Door timer operation.
7) Commercial light package.
8) Explosion and dust ignition proof control wiring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION of 08 4113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install aluminum storefront entry and window systems, including hardware, glazing, and caulking, as described in Contract Documents.

B. Related Requirements:
   1. Section 06 2024: 'Door, Frame, And Hardware Installation' for installation of locking cylinders.
   2. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
   3. Section 08 8100: 'Glass Glazing' for quality of glass glazing.
   4. Section 28 1323: 'Access Control Remote Devices'.
   5. Division 26: 'Electrical' for power Source.

1.2 REFERENCES

A. Association Publications:
   1. American Architectural Manufacturers Association (AAMA):
      a. AAMA SFM 1-14, 'Aluminum Store Front and Entrance Manual'.
      b. AAMA 501-15, 'Methods of Test for Exterior Walls'.
      c. AAMA 609 & 610-15, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents).
      d. AAMA 611-14, 'Voluntary Standards for Anodized Architectural Aluminum'.
      e. AAMA 2605-17, 'Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels'.

B. Definitions:
   1. Glass Surface:
      a. Insulated glass unit:
         1) Surface 1: Exterior surface of outer lite.
         2) Surface 2: Interspace-facing surface of outer lite.
         3) Surface 3: Interspace-facing surface of inner lite.
         4) Surface 4: Interior surface of inner lite.
      b. Monolithic glass:
         1) Surface 1: Spandrel surface (Exterior).
         2) Surface 2: Interior surface.

C. Reference Standards:
   1. ASTM International:
      a. ASTM B221-14, 'Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes'.
      b. ASTM B456-17, 'Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium'.
      c. ASTM B633-15, 'Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel'.
      d. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
      e. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
      f. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.

g. ASTM E331-00(2016), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
1. Participate in pre-installation conference for storefront entrance sections.
2. Schedule conference one (1) week before scheduled installation of storefront system.
3. Participate in pre-installation conference held jointly with following section:
4. In addition to agenda items specified in Section 01 3100, review following:
a. Review installation scheduling, coordination, placement of storefront entrances.
b. Review location of signage on entrance doors.
c. Review delivery, storage, and handling requirements.
d. Review safety issues.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
a. Manufacturer's literature or cut sheets.
b. Color and finish selections.
2. Shop Drawings:
a. Show locations, sizes, etc, of hardware reinforcing.
b. Show wind loads and engineering for Project conditions.
c. Clearly mark components to identify their location in Project.

B. Informational Submittals:
1. Qualification Statement:
a. Installer:
1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Operations and Maintenance Data:
1) Maintenance, adjustment, and repair instructions.
2) Cleaning and maintenance instructions for reflective glazing.
b. Warranty Documentation:
1) Final, executed copy of Warranty.
a) Storefront warranty.
b) Storefront closers.
c. Record Documentation:
1) Manufacturers documentation:
a) Manufacturer's literature or cut sheets for storefront system and for each item of hardware.
b) Color and finish selections.
c) Parts lists.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Storefront System Performance Requirements:
a. Provide test reports from AAMA accredited laboratories certifying performances if requested:
1) Air Leakage: Meet requirements of ASTM E283.
2) Limit air leakage through assembly to 0.06 CFM/min/sq ft (.00003 m3/sm2) of wall area at 6.24 PSF (300 Pa) as measured in accordance with ASTM E283.

3) Water Resistance: No water leakage when measured in accordance with ASTM E331 with static test pressure of 8PSF (384 Pa) as defined by AAMA 501.
4) Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501 with dynamic test pressure of 8 PSF (384 Pa).
5) Limit mullion wind load deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E330/E330M.
6) System shall not deflect more than 1/8 inch (3 mm) at center point, or 1/16 inch (1.58 mm) at enter point of horizontal member, once dead load points have been established.
7) System shall accommodate expansion and contraction movement due to surface temperature differential of 180 deg F (82 deg C).
8) Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.

2. Provide wind load and impact testing by testing laboratory when required by local codes and jurisdictions.
   a. See Section 01 4523 for Testing and Inspection administrative requirements and responsibilities for Testing Agencies and Section 01 4301 for Testing Agency Qualifications.

B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
1. Manufacturer Qualifications:
   a. Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in service performance.
2. Fabricator Qualifications:
   a. Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and that have a record of successful in service performance.
   b. Fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
3. Installer Qualifications:
   a. Minimum three (3) years experience in storefront installations.
   b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
   c. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Deliver all parts of door, together with hardware, in original, unopened packages with labels intact to Project at same time.

B. Storage And Handling Requirements:
1. Store in clean, dry location, indoors in Manufacturer’s unopened packaging until ready for installation and in accordance with Manufacturer’s instructions.
2. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.
3. Protect materials and finish from damage during storage, handling and installation.

1.7 WARRANTY

A. Manufacturer Warranty:
1. Door Construction:
   a. Lifetime warranty for normal use.
      1) Warranty does not include door installation, attached hardware and finish.
2. Closers:
   a. Closer Manufacturer's standard warranty, 10 years minimum.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
1. Approved Manufacturers:
a. Arcadia Inc., Vernon CA www.arcadiainc.com.
1) Contact Information: Ken Martinek, (602) 734-5327 kmartinek@arcadiainc.com.
b. Kawneer North America, Norcross, GA, www.kawneer.com/kawneer/north_america.
1) Contact Information: Bart Daniels cell (385) 214-4650 bart.daniels@alcoa.com.

B. General:
1. In addition to requirements shown or specified, comply with:
a. Applicable provisions of AAMA SFM 1, 'Aluminum Store Front and Entrance Manual' for design, materials, fabrication and installation of component parts.

C. Design Criteria:
1. Storefront System suitable for outside or inside glazing.

D. Materials:
1. Framing Components and Accessories:
a. Aluminum Extrusions:
1) 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
2) Anchors, Clips, and Accessories:
a) Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated (properly isolated steel from aluminum).
3) Fasteners:
a) Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
4) Glazing Gasket:
a) Compression-type design with replaceable extruded EPDM rubber.
5) Reinforcing Members:
a) Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
6) Sealant:
a) Structural Sealant meeting requirements of ASTM C1184 for fabrication within storefront system:
(1) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
(2) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
(3) Color: Black.
b) Joint Sealants used at perimeter of storefront framing system: Elastomeric Sealant as specified in Section 07 9213.
c) Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when required by local codes or AHJ.
7) Tolerances:
a) Tolerances for wall thickness and other cross-sectional dimensions of storefront members in compliance with AA Aluminum Standards and Data.
b. Storefront Framing System:
1) Brackets and Reinforcements:

a) Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

2) Fasteners and Accessories:
a) Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

3) Perimeter Anchors:
a) When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

c. Finish:
1) Match doors.

d. Approved Products:
1) Non-Thermal, 2 inch (50 mm) Sightline:
a) Single Glazed:
(1) AR450 by Arcadia.
(2) Trifab VG 450 by Kawneer.
b) Double Glazed (1-inch insulated glass):
(1) AG451 by Arcadia.
(2) Trifab VG 451 by Kawneer.
c) Curtain Wall (1-inch insulated glass):
(1) T500-Ti Beam Series 5 ½ by Arcadia.

2. Manually Operated Doors:
a. Aluminum: 6063 T6 aluminum alloy, or meeting requirements of ASTM B221, alloy GS 10a T6.

b. Stiles:
1) 3-1/2 inches by 1-3/4 inches by 0.125 inches (89 mm by 45 mm by 3.175 mm) thick nominal.

c. Top Rails:
1) 3-1/2 inches by 1-3/4 inches by 0.125 inches (89 mm by 45 mm by 3.175 mm) thick nominal.

d. Bottom Rail:
1) 10 inches minimum by 1-3/4 inches by 0.125 inches (254 mm minimum by 45 mm by 3.175 mm) thick nominal.

e. Construction:
1) Manufacturer's standard.

f. Glazing Stops:
1) Snap-in type with neoprene bulb-type glazing.
2) Units shall be glazed from exterior side.

g. Weatherstripping:
1) Neoprene bulb-type.
2) Approved Products:
a) Peri-Plus Seal (PPS) by Arcadia.
b) Kawneer Sealair.

h. Factory Finishing:
1) Fluorocarbon Carbon: comply with AAMA 2605:
a) Polyvinyledene Fluoride (PVDF) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum (PVDF) in resin portion of formula and providing pencil hardness of 3H. Thermo-cured two-coat system consisting of corrosion inhibiting epoxy primer and topcoat factory-applied over properly pre-treated metal.
b) Color as selected by Architect from Storefront Manufacturer's standard colors:
c) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
(1) BASF.
(2) PPG Industries, Inc.
(3) Valspar Corporation.

i. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1) Non-Thermal:
a) MS362 Medium Stile by Arcadia.
b) 350 Medium Stile by Kawneer.

3. Glazing:
    a. Glazing as specified in Section 08 8100: 'Glass Glazing'.
    b. Glazing Gaskets:
        1) Compression-type design with replaceable extruded EPDM rubber.
    c. Spacers and Setting Blocks: Elastomeric.
    d. Bond-Breaker (Sealer) Tape: Standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
    e. Glazing Sealant:
        1) Structural Sealant meeting requirements of ASTM C1184:
            a) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
            b) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
            c) Color: Black.
        2) Weather Sealant:
            a) ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weather seal sealant, and aluminum-framed-system manufacturers for this use.
            b) Color: Match structural sealant.
        3) Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Hardware:
    a. Manually Operated Doors:
        1) Hinging:
            a) Top and bottom offset, ball bearing pivots per door leaf.
        2) Overhead Door Closers:
            a) See Section 08 7001.
        3) Exit Devices:
            a) Operation:
                (1) Entry shall be by key. Device shall be locked by cylinder from outside. Key shall be removable when cylinder is in locked or unlocked position.
                (2) Dogging operation shall be by accessible manufacturer's permanent knob, but not by removable allen wrench devices.
                (3) Color: Equivalent to clear anodized.
                (4) Exterior Trim: Pull see Section 08 7001. Types:
                (1) Double Doors Without Mullions: Concealed vertical rods.
        4) Thresholds: See Section 08 70001

E. Fabrication:
1. Construction shall meet Manufacturer's recommendations.
2. Fabricate components that, when assembled, have following characteristics:
    a. Profiles sharp, straight, and free of defects or deformations.
    b. Accurately fit joints; make joints flush, hairline and weatherproof.
    c. Means to drain water passing joints, condensation within framing members, and moisture migrating within system to exterior.
    d. Physical and thermal isolation of glazing from framing members.
    e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
    f. Provisions for field replacement of glazing.
    g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
    h. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements and for hardware attachment.
3. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents. Joints shall be tightly closed.

4. Mortise in manner to give maximum hardware-door connection strength and neatness of appearance. Adequately reinforce with back plates or rivnuts to hold pivots and closers.
5. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
6. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
7. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.
8. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Performance Standard Installers:
   1. General Contractor responsible for Installer(s), verification of qualifications, and performance. Approved Manufacturer's Representative specified in Part 2 'Products' of this specification for potential installers if desired.

3.2 EXAMINATION

A. Verification Of Conditions:
   1. Verify that framed openings comply with Contract Document requirements.
   2. Verify floor is level across entire width of automatic door opening.
   3. Verify sill conditions are level and/or sloped away from openings as specified.
   4. Verify wall framing is dry, clean, sound, and free of voids and offsets, construction debris, sharp edges or anything that will prevent a successful installation of storefront system.
   5. Notify Architect in writing if framed openings are incorrect.
      a. Do not install storefront entry and window frames until deficiencies in framed openings have been corrected.
      b. Commencement of Work by installer is considered acceptance of substrate.

3.3 INSTALLATION

A. General:
   1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
   2. All installation shall be in accordance with manufacturer's published recommendations and in accordance with approved shop drawings.
   3. Do not install damaged components. Fit frame joints tight, free of burrs and distortion. Rigidly secure non-movement joints.
   4. Isolate metal surfaces in contact with incompatible metal or corrosive substrates, including wood, by applying sealer tape to prevent electrolytic action.

B. Set plumb, square, level, and in correct alignment and securely anchor to following tolerances:
   1. Variation from plane: Limit to 1/8 inch (3 mm) in 12 feet (3.6 meters); 1/4 inch (6 mm) over total length.
   2. Offset from Alignment: For surfaces abutting in line, limit offset to 1/16 inch (1.6 mm).
   3. Offset at Corners: For surfaces meeting at corner, limit offset to 1/32 inch (0.8 mm).
   4. Diagonal measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).
   5. Sidelights: Line up horizontal rail in sidelight with door rail.

C. Install doors without warp or rack. Adjust doors and hardware to provide 90 degree operation, tight fit at contact points and smooth operation.

D. Install exterior window units with through wall sill flashing.

E. Thresholds:
   1. Accurately cut thresholds to fit profile of storefront frame. Bed exterior thresholds in specified sealant at contact points with floor and make watertight.
   2. At Vestibule at Retail Area with Floor Mat:
      a. Threshold to line up with threshold of 'Sliding Automatic Entrances, Section 08 4229 and 'Entrance Matting' Section 12 4843.

F. Sealants:
   1. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant' requirements.
   2. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.

G. Glazing Characteristics:
   1. Exterior Doors And Storefront:
      a. Clear interior pane and Clear exterior pane with Low E treatment on surface 2.
   2. Interior Doors And Vestibules:
      a. Clear, except door from Vestibule to Conference Room, obscure.

H. Signage:
   1. Place per drawing details or as indicated on Door Schedule of the drawings
   2. Storefront Exterior Windows:
      a. See window types for glazing and Door Schedule of the drawings for finishes.

3.4 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Pull test doors, especially pairs of single doors separated by permanent mullions, to ensure security of opening.
   2. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.

B. Non-Conforming Work:: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Correct any work found defective or not complying with contract document requirements including removal and replacement of glass that has been broken, chipped, cracked, abraded, or damaged during construction period at no additional cost to the Owner.

3.5 ADJUSTING

A. Adjust doors for proper operation after glazing entry. After repeated operation of completed installation, re-adjust door for optimum operating condition and safety if required.

3.6 PROTECTION

A. During Installation:
   1. Installer's Responsibility:
      a. During installation, all adjacent work shall be protected from damage.

B. After Installation:
   1. General Contractor's Responsibility:
      a. Institute protective measures required throughout remainder of construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

3.7 CLEANING

A. General:
   1. Installer's Responsibility:
      a. Follow Manufacturer's written recommendations for cleaning and maintenance or guidelines of AAMA 609 & 610 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents). Avoid damaging protective coatings and finishes.
      b. Clean glass and aluminum surfaces, inside and out, promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Exercise care to avoid damage to coatings.
      c. Remove nonpermanent labels, protective films, and clean surfaces following recommended procedures.
         1) Do NOT remove permanent ANSI/AAMA/CSA or NFRC labels.

B. Waste Management:
   1. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

THIS PAGE IS BLANK

SECTION 08 8100

GLASS GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of glazing used in entries, doors, and windows.

B. Related Requirements:
   1. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for furnishing and installing of glazing in aluminum-framed storefront.
   2. Section 08 5000: Windows' for furnishing and installing of glazing in windows.

1.2 REFERENCES

A. Definitions:
   1. Glass Surface:
      a. Insulated glass unit:
         1) Surface 1: Exterior surface of outer lite.
         2) Surface 2: Interspace-facing surface of outer lite.
         3) Surface 3: Interspace-facing surface of inner lite.
         4) Surface 4: Interior surface of inner lite.
      b. Monolithic glass:
         1) Surface 1: Exterior surface.
         2) Surface 2: Interior surface.
   2. Insulated Glass: Two pieces of glass spaced apart and hermetically sealed to form single-glazed unit with air space between. Heat transmission through this type of glass may be as low as half that without air space. Also called double glazing, double pane, insulated unit, and thermal pane.
   3. Laminated Glass: Two or more sheets with inner layer of transparent plastic to which glass adheres if broken. Used for overhead, safety glazing, and sound reduction.
   4. Low-Emissivity Glass (Low-E): Reduces wintertime heat loss from interior with thin, almost colorless metallic coating that reflects heat back inside structure. Allows moderate solar heat gain while reducing harmful ultraviolet light in any season. Minimizes summertime air conditioning loss by reflecting radiated heat to outside. May be tempered for where safety glass is required. Available in single strength clear, gray and bronze (brown) color.
   5. Obscure Glass: Adds privacy where window coverings are impractical or undesirable. Various colors and texture patterns provide translucent or semi-opaque effect. May be tempered for use where safety glass is required.
   6. Shading Coefficient: Ratio of solar heat gain passing through a glazing system to solar heat gain that occurs under the same conditions if the window was made of clear, unshaded double strength glass. Lower SC number, the better solar control efficiency of glazing system.
   7. Solar Heat Gain Coefficient (SHGC): Ratio of total solar heat passing through a given window relative to the solar heat incident on the projected window surface at normal solar incidence. (Percentage of solar energy directly transmitted or absorbed and re-radiated into a building). Lower SHGC, the better it is able to reduce heat.
   8. Solar Reflectance (R): Percent of incident solar radiation that is reflected by window film/glass system. Lower the number, the less solar radiation reflected.
   9. Tempered Glass: Glass strengthened through process of heating, creating tensile strength that causes glass to resist breakage, yet disintegrate into small pieces if break occurs. Tempered glass is type of safety glass.

10. U-Value: Measurement of heat transfer through film due to outdoor/indoor temperature differences. Lower U-value, less heat transfers. When using performance data, the lower U-value, better insulating qualities of window film/glass system.
11. Visible Light Transmitted (VLT): Percent of total visible light (380-780 nanometers) that passes through glass. Lower the number, the less visible light transmitted.

B. Reference Standards:
1. American National Standards Institute:
   a. ANSI Z97.1-2009, 'Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test'.
2. ASTM International:
   a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
   b. ASTM C1048-18, 'Standard Specification for Heat-Treated Flat Glass - Kind H, Kind FT Coated and Uncoated Glass'.
   c. ASTM C1172-14, 'Standard Specification for Laminated Architectural Flat Glass'.
   d. ASTM C1281-16, 'Standard Specification for Preformed Tape Sealants for Glazing Applications'.
   e. ASTM E2190-10, 'Standard Specification for Insulating Glass Unit Performance and Evaluation'.
3. Consumer Products Safety Commission (CPSC):
   a. 16 CFR, Part 1201 CAT 1 and 11, 'Safety Standard for Architectural Glazing Materials'.

1.3 SUBMITTALS

A. Action Submittals:
1. Product Data:
   a. Manufacturer's data sheets for each glass product and glazing material.

B. Informational Submittals:
1. Qualification Statement:
   a. Installer:
      1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
   a. Warranty Documentation:
      1) Final, executed copy of Warranty.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Glazing shall meet applicable requirements of Federal Consumer Product Safety Standard 16 CFR 1201.
2. Comply with published recommendations of glass product Manufacturers and organizations, except where more stringent requirements are indicated.

B. Qualifications:
1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
   a. Satisfactorily completed at least three (3) installations of similar size, scope, and complexity in each of past two (2) years and be approved by glass product Manufacturer before bidding.
   b. Upon request, submit documentation.

C. Certifications:
1. Labels showing strength, grade, thickness, type, and quality are required on each piece of glass.
2. Manufacturers/Fabricators certifying products furnished comply with project requirements.
3. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Follow Manufacturer's instruction for receiving, handling, and protecting glass & glazing materials to prevent breakage scratching, damage to seals, or other visible damage.
   2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage And Handling Requirements:
   1. Follow Manufacturer's instruction for storing and protecting glass & glazing materials.
   2. Store materials protected from exposure to harmful environmental conditions and at temperatures and humidity conditions recommended by Manufacturer.
   3. Protect edge damage to glass, and damage/deterioration to coating on glass.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Insulating Glass Warranty:
      a. Manufacturer's standard form, signed by insulating-glass product Manufacturer/Fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by obstruction of vision by dust, moisture, or film on interior surfaces of glass, for ten [10] years of date of installation.
   2. Installer's Warranty:
      a. Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, for two (2) years from date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Manufacturer Contact List for Low E Glazing:
      a. AGC Flat glass North America, Kingsport, TN www.us.agc.com.
      b. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN www.carlex.com.
      c. Guardian Industries Corp., Auburn Hills, MI www.guardian.com.
      d. Oldcastle BuildingEnvelope, Santa Monica, CA www.oldcastlebe.com.
      e. Pilkington North America Inc., Toledo, OH www.pilkington.com.
      f. Vitro Architectural Glass (formerly PPG glass), Cheswick, PA www.ppgglass.com

B. Design Criteria:
   1. Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.

C. Exterior Window Glazing:
   1. Thickness: 1/4 inch (6 mm),
   2. Glazing shall have following characteristics:

a. Low-Emissivity (or Low E):
1) Design Criteria:
a) Clear:
b) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
c) Location: Surface 2.
2) Low-Emissivity (or Low E) Acceptable Product:
a) Performance Standard:
(1) 70 percent Visible Light Transmission (VLT).
(2) 0.29 U-value winter.
(3) 0.27 U-value summer.
(4) 0.38 Solar Heat Gain Coefficent (SHGC).
(5) 0.44 Shading Coefficient.
(6) 11 percent Visible Light Reflectance.
b) Quality Standard:
(1) Cardinal LoE³-366.
(2) Solarban 70 XL.
(3) Other low E glazing system standard with window manufacturer that meets or exceeds performance characteristics of specified glazing is acceptable as approved by Architect before bidding. See Section 01 6200.
3) Acceptable Manufacturers:
a) AGC.
b) Guardian.
c) Vitro Architectural Glass.
d) Equal as approved by Architect before bidding. See Section 01 6200.
b. Glazing in Windows within 24 inches (600 mm) of Exterior Doors:
1) Design Criteria:
a) Tempered.
b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.

D. Storefront Glazing:
1. Thickness: 1/4 inch (6 mm).
2. Glazing shall have following characteristics:
a. Low-Emissivity (or Low E):
1) Design Criteria:
a) Clear.
b) Insulated Glass: 1 inch (25 mm) units with 1/2 inch (13 mm) airspace and two (2) 1/4 inch (6 mm) lites.
c) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
d) Location: Surface 2.
2) Low-Emissivity (or Low E) Acceptable Product:
a) Performance Standard:
(1) 64 percent Visible Light Transmission (VLT).
(2) 0.28 U-value winter.
(3) 0.26 U-value summer.
(4) 0.27 Solar Heat Gain Coefficent (SHGC).
(5) 0.32 Shading Coefficient.
(6) 12 percent Visible Light Reflectance.
b) Quality Standard:
(1) Cardinal LoE³-366.
(2) Solarban 70 XL.
(3) Equal product by Acceptable Manufacturer as approved by Architect before bidding. See Section 01 6200.
3) Acceptable Manufacturers:
a) AGC.
b) Guardian.
c) Vitro Architectural Glass.
d) Equal as approved by Architect before bidding. See Section 01 6200.
b. Glazing Below Door Height:
1) Design Criteria:

a) Tempered.
b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.

E. Interior Pass-Through Window Glazing:
1. Thickness: 1/4 inch (6 mm).
2. Glazing shall have following characteristics:
a. Design Criteria:
1) Clear:
2) Tempered.
3) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.

F. Fabrication:
1. Except where glass exceeds 66 inches (1 675 mm) in width, cut clear glass so any wave will run horizontally when glazed.
2. Install muntins for exterior aluminum entries and aluminum windows between panes of insulating glazing units. No muntins on interior Vestibule storefront entries.
3. Sealed, Insulating Glazing Units:
a. Double pane, sealed insulating glass units. Install at exterior windows and exterior aluminum-framed storefront.
b. Unit Thickness: 5/8 inch (16 mm) minimum, one inch (25 mm) maximum.
c. Insulated obscure units shall consist of one pane of specified obscure glass and one pane of standard glass.
d. Type Seal:
1) Metal-to-glass bond and separated by 1/2 inch (12.7 mm) dehydrated air space.
2) Use non-hardening sealants.
e. Category Four Approved Fabricators. See Section 01 6200 for definitions of Categories.
1) Members of Sealed Insulating Glass Manufacturer's Association.

2.2 ACCESSORIES

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Glazing Tape: Butyl-based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation, complying with ASTM C1281 and AAMA 800 for application.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 09 0503

FLOORING SUBSTRATE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Coordination and scheduling of Field Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete slab before flooring installation (except carpet) as described in Contract Documents.
   2. Preparing floor substrate to receive flooring as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation tolerances for concrete slabs.

1.2 REFERENCES

A. Association Publications:
   1. International Concrete Repair Institute: *'ICRI Concrete Slab Moisture Testing Program'* Rosemont, IL www.icri.org.
      a. ICRI Certification: 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1'.

B. Reference Standards:
   1. ASTM International:
      a. ASTM F710-17, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
      b. ASTM F1869-16a, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'.
      c. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Concrete Moisture Testing:
      a. General Contractor Responsibility to provide:
         1) Maintain ambient temperatures and relative humidity conditions as specified in Field Conditions in Part 1 of this specification before Moisture Testing Agency will test for concrete moisture.
         2) Coordinate with Moisture Testing Agency when building is enclosed and temperature and relative humidity meet requirements for testing.
         3) Provide access for and cooperate with Moisture Testing Agency.
      b. Installing Contractor Responsibility to provide:
         1) Provide following information to Moisture Testing Agency at time of notification:
            a) Digital copy of floor plan(s).
            b) Indicate different flooring material areas and which rooms on floor plan(s) and finish schedule requiring additional tests if required.
            c) Digital copy of Specification Section 09 0503 (this specification) and Section 01 4523 'Testing And Inspecting Services' from Contract Documents for this Project.
         2) Carpet Flooring:
            a) Carpet Installer at his/her discretion may test concrete slab for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) before installation of Owner Furnished carpet.

b) If carpet area is tested, Installer to coordinate with Owner's Representative for following:
(1) Scheduling and coordination for maintain ambient temperatures and relative humidity conditions required before Moisture Testing of concrete moisture.
(2) Access to Building for concrete moisture testing.

1.4 SUBMITTALS

A. Informational Submittals:
1. Certificates:
a. Concrete Slab Moisture Technician:
1) Provide current ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification.
b. Certified Standard Moisture Testing Report:
1) Report to include following:
a) Available to Testing Agency from Owner's Representative:
(1) Project Name.
(2) Property Number.
b) Test date.
c) Executive summary.
d) Certified Moisture and Alkalinity (pH) Test Report.
e) Project floor plan.
f) Project photographs including following information on each photograph:
(1) Site location.
(2) Test hole number.
(3) Serial number probe.
(4) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
(5) Property number.
g) Outlier Test (As specified in Field Quality Control Testing in Part 3 of this specification:
(1) Note test as Outlier Test for which hole number was conducted.
(2) Site location.
(3) Test hole number.
(4) Serial number probe.
(5) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
(6) Property number.
2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
a) One (1) copy to Owner's Representative.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Testing and Inspection Reports:
a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:
1. Provide storage space and protection for flooring and installation accessories if materials are delivered before start of flooring installation.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building (service conditions). Service conditions include normal levels of humidity, lighting, heating, and air conditioning:

a. If service conditions are not possible, test conditions shall be 75 deg F (23.9 deg C) ± 10 deg F (minus 12.2 deg C) maintain relative humidity between forty (40) and sixty (60) percent in spaces to receive testing.

2. Maintain these conditions forty-eight (48) hours prior to, and during testing. Otherwise, results may not accurately reflect amount of moisture which is present in concrete slab or would normally be emitted from or through concrete slab during normal operating conditions.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Flooring Preparation:
1. General:
a. Prepare floor substrate in accordance with ASTM F710, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring' (This standard is used for preparing concrete floors for all flooring).
1) Required RH test and alkalinity test of concrete slab has been performed.
b. Concrete floor slab patching:
1) Cracks, chips and joints must be properly patched or repaired.
c. Concrete surface cured, clean, dry, and free of dirt, dust, grease, wax, and other foreign substances that will compromise flooring installations.
1) Removal of curing compounds.
2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
3) Removal of overspray from painted walls (essential so glue will stick).
d. Vacuum and damp mop floor areas to receive flooring before flooring installation.
2. Carpeted floor areas:
a. Prepare floor substrate in accordance with Carpet And Rug Institute (CRI) best practices to receive carpet installation and to provide installation that meets Carpet Manufacturer's warranty requirements.

B. Carpet Accessories:
1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
1. General:
a. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Concrete Moisture and Alkalinity:
a. Testing Agency will test interior concrete slabs before installation of floor coverings as directed by Architect and will include following:
1) Interior concrete slab areas to be tested:
2) Standard Moisture Testing required of interior concrete slabs on grade:
a) General:
(1) Testing for concrete moisture shall be taken at concrete slab substrates scheduled to receive flooring as specified in Contract Drawings for complete flooring installation.
(2) Outlier Test: If one (1) test is abnormally different from other moisture tests, then additional test should be done. Outlier will be defined in this specification as moisture test that is at least fifteen (15) percent higher or lower than other tests at project building completed same day:
(a) Retesting should be done within 5 feet (1.50 m) feet of original test hole.

(b) Contact Owner's Representative for the need to outlier test and additional testing fees will apply.

(3) Include required tests for carpeting and additional tests at each different type of flooring system included for project.

b. Approved Concrete Moisture Tests:

1) Concrete Moisture Test (test used with Standard Moisture and Comprehensive Moisture Testing if included for project). See Section 01 6200:

a) Relative Humidity (RH) testing using in-situ probes in accordance with ASTM F2170 testing requirements:

(1) Check calibration of measuring instrument.

(2) Building ambient conditions are met before testing.

(3) Drill Hole:

(a) Drill and prepare test holes as per ASTM F2170 (correct hole-depth and hole diameter are required).

(b) Drill holes equal to forty (40) percent of slab's thickness for concrete slabs on grade and twenty (20) percent of slab's thickness for suspended concrete slabs (hole must be perpendicular (90 deg) to surface).

(4) Clean Hole:

(a) Follow Manufacturer's installation instructions for cleaning holes and inserting sensor.

(5) Insert Sensor:

(a) Follow Manufacturer's installation instructions for inserting sensor.

(6) Readings:

(a) Follow Manufacturer's installation instructions for taking readings.

(b) Two (2) hours after installation of sensor, RH reading will be recorded. (Two (2) hour read is in lieu of the seventy-two (72) hour ASTM standard)

(7) Future Testing:

(a) For future readings, replace protective cap by snapping it back into sensor.

(8) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.

(a) For future readings, replace protective cap by snapping it back into sensor.

b) Approved Products. See Section 01 6200.

(1) Concrete moisture testing meter:

(a) Rapid RH 4.0 EX with Touch-n-Sense Technology and Rapid RH EX Smart Sensors by Wagner Meters, Rogue River, OR www.wagnermeters.com.

2) Alkalinity Testing (pH) Test:

a) Testing shall be performed in accordance with ASTM F710.

b) Test with pH meter or pH paper.

c) Testing shall be taken at every location and at each time concrete moisture test is performed at those locations.

d) Clean floor to remove all oil, dirt, dust and any floor coating or sealer.

(1) Lightly grind, sand, or bead blasting. Do not remove more than 1/8 inch (3 mm) of concrete.

(2) Removal of more than 1/8 inch (3 mm) may give high pH reading.

(3) Failure to remove laitance will produce low, inaccurate pH reading.

e) Place several drops of water on clean surface, forming puddle approximately 1 inch (25 mm):

(1) Allow puddle to set for sixty (60) ± five (5) seconds, then dip pH paper or meter into water.

(2) Remove immediately and record test result.

f) Testing to be performed concurrently with concrete moisture testing.

g) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.

END OF SECTION

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install metal framing and furring systems and blocking as described in Contract Documents.

B. Related Requirements:
   1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing'.
   2. Section 06 1100: 'Wood Framing' for wood blocking.

1.2 REFERENCES

A. Association Publications:
   1. Steel Framing Industry Association (SFIA):
      a. SFIA 'Technical Guide for Cold-Formed Steel Framing Products', www.sfia.net.
   2. Steel Stud Manufacturers Association (SSMA):
      a. 2015 IBC - SSMA 'Product Technical Guide'.

B. Definitions:
   1. Non-Structural Member: Member in steel-framed system that is not part of the gravity load resisting system, lateral force resisting system or building envelope.

C. Reference Standards:
   1. American Iron and Steel Institute (AISI):
      a. AISI S220-15, 'North American Specification For The Design Of Cold-Formed Steel Framing – Nonstructural Members'.
   2. ASTM International:
      a. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
      b. ASTM A1003/A1003M-15, 'Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members'.
      c. ASTM C645-18, 'Standard Specification for Nonstructural Steel Framing Members'.
      d. ASTM C754-18, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
      e. ASTM C1513-18, 'Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections'.
      f. ASTM E119-18, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Schedule pre-installation conference to be held after submittals have been reviewed and returned by Architect, but before beginning metal framing work.
   2. In addition to agenda items specified in Section 01 3100, review following:
      a. Identify location of required blocking.

1.4 SUBMITTALS

A. Action Submittals:
1. Shop Drawings:
a. Show special components and installations not fully dimensioned or detailed in Manufacturer's Product data.

B. Informational Submittals:
1. Test And Evaluation Reports:
a. ATI, ICC or other Approved Testing Agency (active member) Evaluation Report.
2. Manufacturer Instructions:
a. Technical product data, installation instructions, and recommendations for each component of system.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. CBC approved.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Acceptable Manufacturers:
a. CEMCO, City of Industry, CA www.cemcosteel.com.
b. ClarkDietrich Building Systems, West Chester, OH www.clarkdietrich.com.
c. Any member of Steel Framing Industry Association (SFIA).
d. Any member of Steel Stud Manufacturer's Association (SSMA).
e. Equal as approved by Architect before bidding. See Section 01 6200.

B. Materials:
1. Framing:
a. General:
1) 20 gauge minimum, unless noted greater on Drawings, meeting requirements of ASTM C645.
2) Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
3) Steel Coating Requirement: Comply with ASTM C645 roll-formed from hot dipped galvanized steel complying with ASTM A1003/A1003M and/or ASTM A653/A653M G40 (Z120) or equivalent corrosion resistant coating. A40 galvannealed products are not acceptable.
a) Coatings shall demonstrate equivalent corrosion resistance with evaluation report from approved testing agency.
b. Steel Studs and Runners: Cold-formed galvanized steel C-studs, as per ASTM C645 for conditions indicated.
c. Bridging, blocking, strapping, and other accessories shall be as described in Contract Documents or as required by Manufacturer's system.
d. Type One Acceptable Products:
1) 362DS20P by CEMCO.
2) ProSTUD 20 by ClarkDietrich Building Systems.
3) 20 Ga 3-5/8 SS Series by Steeler Inc.
4) Any member of Steel Framing Industry Association (SFIA).
5) Any member of Steel Stud Manufacturer's Association (SSMA).
6) Equal as approved by Architect before bidding. See Section 01 6200.
2. Firestop Tracks:

a. Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

3. Headers and Jambs - Heavy-Duty Stud:
   a. Shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.

C. Fasteners:
   1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.

2.2 ACCESSORIES

A. Sill Sealer: Closed-cell polyethylene foam, 1/4 inch (6 mm) thick by width of plate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
   1. Coordinate with other Sections to provide blocking necessary for their work.
   2. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties.

B. Tolerances:
   1. 1/4 inch (6 mm) in 20 feet (6 meters), non-cumulative in length of wall.
   2. 1/8 inch (3 mm) in 10 feet (3 meters) with 1/4 inch (6 mm) maximum in height of wall.
   3. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.

C. Framing:
   1. Installation Standard: ASTM C754.
   2. Specifications of Stud Wall Manufacturer shall govern this work unless more stringent requirements are required by Contract Documents.
   3. Install specified sill sealer under sill plates of exterior walls and of acoustically insulated interior walls.
   4. Stiffen metal-framed walls with 3/4 inch (19 mm) 1-1/2 inches (38 mm) cold formed channels placed horizontally approximately 48 inch (1 200 mm) on center and securely attach to each stud.
   5. Similarly reinforce door and window openings at headers with reinforcing channel extending 18 inches (450 mm) minimum each side of opening.
   6. Apply double framing members at openings. Wrap multiple, adjacent framing members with duct tape or otherwise secure to eliminate 'chattering'.
   7. Use grommets at framing penetrations where unsecured items pass through.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install gypsum board as described in Contract Documents, except behind ceramic tile.
   2. Furnish and install acoustical sealants as described in Contract Documents.

B. Related Requirements:
   1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing'.
   2. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
   3. Section 09 2216: 'Non-Structural Metal Framing'.
   4. Section 09 3013: 'Ceramic Tile' for installation of backerboard joint reinforcing.
   5. Section 09 9413: 'Interior Textured Finishing'.

1.2 REFERENCES

A. Definitions:
   1. Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
   2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
   3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
   4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.

B. Reference Standards:
   1. ASTM International:
      a. ASTM C11-18, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems'.
      b. ASTM C475/C475M-17, 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board'.
      c. ASTM C840-18a, 'Standard Specification for Application and Finishing of Gypsum Board'.
      d. ASTM C1002-18, 'Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs'.
      e. ASTM C1047-14a, 'Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base'.
      f. ASTM C1178/C1178M-18, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel'.
      g. ASTM C1396/C1396M-17, 'Standard Specification for Gypsum Board'.
      h. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
      i. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
      j. ASTM E119-18b, 'Standard Test Method for Fire Tests of Building Construction and Materials'.

2. Gypsum Association:
   a. GA-214-15, 'Recommended Levels of Gypsum Board Finish'.
   b. GA-216-16: 'Application and Finishing of Gypsum Panel Products'.
   c. GA-600-15, 'Fire Reference Design Manual'.
   d. GA-801-2017, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors'.
3. California Building Code (CBC) (2018 or latest approved version):
   a. Chapter 25, 'Gypsum Board And Plaster'.
4. Underwriters Laboratories, Inc.
   a. UL 263: 'Test Method for Fire Tests of Building Construction and Materials' (14th Edition).
   b. UL 723: 'Test for Surface Burning Characteristics of Building Materials; (11th Edition).

1.3 SUBMITTALS

A. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General:
   1. Following recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.

B. Delivery And Acceptance Requirements:
   1. Deliver materials in original packages, containers, or bundles bearing brand name, applicable standard designation, and Manufacturer's name.

C. Storage And Handling Requirements:
   1. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

1.5 FIELD CONDITIONS

A. Ambient Conditions:
   1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
      a. Do not install interior products until installation areas are enclosed and conditioned.
         1) Temperature shall be 50 deg F (10 deg C) and 95 deg F (35 deg C) maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
         2) Provide ventilation to eliminate excessive moisture.
         3) Avoid hot air drafts that will cause too rapid drying.
      b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Manufacturer Contact List:
      a. American Gypsum, Dallas, TX www.americangypsum.com.

b. CertainTeed Gypsum, Inc; Tampa, FL www.certainteed.com.
c. Georgia Pacific, Atlanta, GA www.gp.com.
d. National Gypsum, Charlotte, NC www.nationalgypsum.com.
e. Pabco Gypsum, Newark, CA www.pabcogypsum.com.
f. United States Gypsum Co, Chicago, IL www.usg.com.

B. Materials:
1. Interior Gypsum Board:
a. General:
1) Size:
a) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
2) Quality Standard:
a) Core: Fire-resistant rated gypsum core.
b) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
c) Surface paper: Face paper suitable for painting.
d) Long edges: Tapered edge.
e) Overall thickness: 5/8 inch (15.9 mm).
2. Glass Mat Gypsum Tile Backer:
a. Product meeting requirements of ASTM C1178/C1178M.
b. Type X, 5/8 inch (15.9 mm).
c. Square edges.
d. Approved Manufacturer. See Section 01 6200.
1) DensShield Fireguard Type X by Georgia Pacific.
2) GlasRoc Tilebacker Type X by CertainTeed.

2.2 ACCESSORIES

A. Manufacturers:
1. Manufacturer Contact List:
a. Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
b. Magnum Products, Lenaxa, KS www.levelcoat.com.
c. National Gypsum, Charlotte, NC www.nationalgypsum.com.
d. Soundproofing Co, San Marcos, CA www.soundproofing.org.
e. United States Gypsum Co, Chicago, IL www.usg.com.
f. Westpac Materials Inc, Orange, CA www.westpacmaterials.com.
g. Wm. Zinsser & Co, Somerset, NJ www.zinsser.com.
2. Gypsum Board Mounting Accessories:
a. Furring Channels:
1) Quality Standards. See Section 01 6200 for definitions:
a) Walls: Galvanized DWFC-25.
2) Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
b. Corner And Edge Trim:
1) Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
c. Control Joint:
1) Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
3. Joint Compound:
a. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
1) Use Taping Compound for first coat to embed tape and accessories.
2) Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
3) Use Finishing Compound for final coat and for skim coat.
4. Joint Reinforcing:
a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
5. Fasteners:

a. Bugle head screws meeting requirements of ASTM C1002:
   1) Gypsum Board:
      a) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing 5/8 inch (15.9 mm) minimum.
      b) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing 3/8 inch (9.5 mm) minimum.
   2) Glass Mat Gypsum Tile Backer:
      a) Wood Framing: 11 ga (0.1233 in) (3.1318 mm), galvanized with 7/16 inch (11 mm) head, hot dipped. Screws: Type W or Type S Hi-Lo, bugle head, rust resistant.
      b) Metal Framing:
         (1) Light-gauge metal framing: Type S Hi-Lo, bugle or wafer head, self-tapping, rust resistant. Hi-Lo screws.
         (2) Heavy-gauge metal framing: Type S-12 Hi-Lo, bugle or wafer head, rust resistant.

B. Primer / Surfacer On Surfaces To Receive Texturing:
   1. Acceptable Products:
      a. Sheetrock First Coat by USG.
      b. Prep Coat by Westpac Materials.
      c. Level Coat by Magnum Products.
      d. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Examine substrate and verify framing is suitable for installation of gypsum board.
   2. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
   3. Notify Architect of unsuitable conditions in writing.
      a. Do not install board over unsuitable conditions.
   4. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

A. Interface With Other Work:
   1. Coordinate with Division 06 for location of back blocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
   2. Do not install gypsum board until required blocking is in place.

B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.

C. Interior Gypsum Board:
   1. General:
      a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over 1/8 inch (3 mm) wide before taping are acceptable.
      b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
      c. On walls over 108 inches (2 700 mm) high, apply board perpendicular to support
      d. Butt edges in moderate contact. Do not force in place. Shim to level.
      e. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.
      f. Scribe work closely:

1) Keep joints as far from openings as possible.
2) If joints occur near an opening, apply board so vertical joints are centered over openings.
3) No vertical joints shall occur within 8 inches (200 mm) of external corners or openings.

g. Install board tight against support with joints even and true. Tighten loose screws.
h. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.

2. Ceilings:
   a. Apply ceilings first using minimum of two (2) men.
   b. Use board of length to give minimum number of joints.
   c. Apply board perpendicular to support.
   d. Do not wet gypsum board prior to installation.
   e. Showroom:
      1) Single Layer Application:
         a) Stagger end joints:
            (1) End and edge joints of board applied on ceilings shall occur over framing members or be back blocked with 2x4 (38 mm by 89 mm) blocking.
            (2) Edge joints of board vertically applied on walls shall occur over framing members.
            (3) 2x4 (38 mm by 89 mm) blocking is required at wall to ceiling transitions and at top of ceiling vault transitions.
3. Fastening:
   a. Apply from center of board towards ends and edges.
   b. Apply screws 3/8 inch (9.5 mm) minimum from ends and edges, one inch (25 mm) maximum from edges, and 1/2 inch (13 mm) maximum from ends.
   c. Spacing:
      1) Ends: Screws not over 7 inches (175 mm) on center at edges where blocking or framing occurs.
      2) Wood Framed Walls And Ceilings: Screws 7 inches (175 mm) on center in panel field.
      3) Metal Framed Walls: Screws 12 inches (300 mm) on center in panel field.
   d. Set screw heads 1/32 inch (0.8 mm) below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw 2 inches (50 mm) away.
   e. Screws on adjacent ends or edges shall be opposite each other.
   f. Drive screws with shank perpendicular to face of board
4. Trim:
   a. Corner Beads:
      1) Attach corner beads to outside corners.
         a) Attach metal corner bead with staples spaced 4 inches (100 mm) on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
         b) Set paper-faced trim in solid bed of taping compound.
   b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames 1/8 inch (3 mm) to allow for caulking.
5. Finishing:
   a. General:
      1) Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
      2) First Coat:
         a) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
         b) Completely fill gouges, dents, and fastener dimples.
         c) Allow to dry and sand lightly if necessary, to eliminate high spots or excessive compound.
      3) Second Coat:

a) Apply coat of specified joint compound over embedded tape extending 3-1/2 inches (88 mm) on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
b) Re-coat gouges, dents, and fastener dimples.
c) Allow to dry and sand lightly to eliminate high spots or excessive compound.

4) Third Coat: Apply same as second coat except extend application 6 inches (150 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
5) Fourth Coat: Apply same as second coat except extend application 9 inches (425 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.

b. Finishing Levels: Finish panels to levels indicated below and according to ASTM C840, GA-214 and GA-216:
1) Gypsum Board Surfaces not painted or finished:
a) GA-214 Level 1: 'All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable'.
2) Gypsum Board Surfaces to Receive: Painted Texturing - Section 09 9413: 'Interior Textured Finishing':
a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
3) Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.

D. Glass Mat Gypsum Tile Backer:
1. Apply glass mat gypsum tile backer to framing. Attach using specified fasteners spaced 6 inches (150 mm) on center on edges and into all framing members. Drive screws flush with surface of board.
2. Shim board to be plumb and flat or level and flat, depending on location.
3. Apply reinforcing only at joints where abutting different materials.

3.3 FIELD QUALITY CONTROL

A. Non-Conforming Work:
1. Remove and replace panels that are wet, moisture damaged, and mold damaged.
a. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.4 CLEANING

A. Remove from site debris resulting from work of this Section including taping compound spills.

END OF SECTION

SECTION 09 3013

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install ceramic tile and tile setting materials and accessories as described in Drawings.

B. Related Requirements:
   1. Section 09 2900: Installation of backerboard behind ceramic tile, except for joint reinforcing.
   2. Division 23: Floor drains.

C. Products Installed But not Furnished Under This Section:
   1. Interior Ceramic Tile Joint Sealants:

D. Related Requirements:
   1. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

A. Association Publications:
   1. American National Standard Specification (ANSI) for the Installation of Ceramic Tile.
   2. International Standards Organization (ISO) 13007, 'Classification for Adhesives and Grout'.
   3. Tile Council of North America:
      a. TCNA Handbook, 'Handbook for Ceramic Tile Installation, 2011'.

B. Definitions:
   1. Crack Isolation: Prevention of transfer of cracks from substrate through tile or stone when substrate is subjected to horizontal movement of cracks.
   2. Dry-Set Mortar: Water-retentive hydraulic cement mortar usable with or without sand. When this mortar is used, neither tile nor walls have to be soaked during installation.
   3. Dynamic Coefficient of Friction (DCOF): Measures ratio of forces necessary to keep two surfaces sliding.
   4. Epoxy Grout: Mortar system employing epoxy resin and epoxy hardener portions.
   5. Grout: Rich or strong cementitious or chemically setting mix used for filling tile joints.
   6. ISO 13007 Standards Product Classifications:
      a. Adhesives:

Types	Classes	Special Characteristics
C = Cementitious (Thin-Set Mortars)	1 = Normal 2 = Improved	F = Fast-Setting T = Slip-Resistant E = Extended Open Time S1 = Deformable S2 = Highly Deformable P1 = Plywood Adhesion P2 = Improved Plywood Adhesion
D = Dispersion	1 = Normal	F = Fast-Setting

(Mastics)	2 = Improved	T = Slip-Resistant E = Extended Open Time
R = Reaction Resin (Epoxies)	1 = Normal 2 = Improved	T = Slip-Resistant

1) Cementitious Adhesive (C): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, and organic additives (e.g. latex polymers, moisture retention additive, etc…) to be mixed with water or latex admix before mixing.
2) Dispersion Adhesive (D): Ready-to-use mixture of organic binding agents in the form of an aqueous polymer dispersion, organic additives and mineral fillers - mastic type products.
3) Reaction Resin Adhesive (R): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
4) Class 1 (1): Adhesive has passed minimum pass level tests that are mandatory for that adhesive type.
5) Class 2 (2): Adhesive has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
6) Fast-Setting (F): Adhesive with accelerated cure time that must achieve minimum strength requirements of fast setting adhesive. This designation does not apply to reaction resin adhesives (R).
7) Slip-Resistance (T): Downward movement of a tile applied to combed adhesive layer on vertical surface must be ≤ 0.5mm for a C or D adhesive, and ≤ 5mm for a type R adhesive.
8) Extended Open Time (E): Maximum time interval after application at which tiles can be embedded in applied adhesive and meet tensile adhesion strength requirement must be ≥ 30 minutes. This designation does not apply to reaction resin adhesives (R).
9) Deformability (S): Capacity of hardened adhesive to be deformed by stresses between tile and substrate without damage to installed surface – to pass S1 requirements an adhesive must be able to deform ≥ 2.5mm but < 5mm; to pass S2 requirements an adhesive must be able to deform ≥ 5mm. This designation does not apply to reaction resin adhesives (R).
10) Exterior Glue Plywood (P): Adhesive with ability to bond tile or stone to exterior glue plywood substrates (interior only). This designation does not apply to reaction resin adhesives (R) or dispersion adhesives (D).

b. Grouts:

Types	Classes	Special Characteristics
CG = Cementitious Grout	1 = Normal 2 = Improved	F = Fast-Setting A = High Abrasion Resistance W = Reduced Water Absorption
RG = Reaction Resin Grouts	1 = Normal 2 = Improved	Higher performance characteris-tics than improved cementitious grouts

1) Cementitious Grout (CG): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, inorganic and organic additives (e.g. latex polymers, moisture retention additive, etc…).
2) Reaction Resin Grout (RG): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
3) Class 1 (1): Grout has passed minimum pass level tests that are mandatory for cementitious grouts.
4) Class 2 (2): Cementitious grout has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.

5) Fast-Setting (F): Grout with accelerated cure time that must achieve minimum compressive strength requirements under normal conditions within twenty four (24) hours. This designation applies only to cementitious grouts (CG).
6) High Abrasion Resistance (A): Capability of grout to resist wear. This designation applies only to cementitious grouts (CG).
7) Reduced Water Absorption (W): Grout has lower water absorption rate than standard cementitious grout. This designation applies only to cementitious grouts (CG).

7. Latex/Polymer Modified Portland Cement Mortar: Latex/Polymer modified portland cement mortar is a mixture of portland cement, sand, and special latex/polymer additive that is used as a bond coat for setting tile.
8. Mastic: Tile adhesive.
9. Mortar Bed: Layer of mortar on which tile is set. Final coat of mortar on wall, floor or ceiling is called a mortar bed.
10. Movement Joints:
    a. Construction Joint: Surface where two successive placements of concrete meet, across which it may be desirable to achieve bond, and through which reinforcement may be continuous.
    b. Contraction Joint: Formed, sawed or tooled groove in concrete structure to create weakened plane and regulate location of cracking resulting from dimensional change of different parts of structure. See also Isolation Joint.
    c. Control joint: See contraction joint.
    d. Expansion Joint: (1) Separation provided between adjoining parts of structure to allow movement where expansion is likely to exceed contraction; (2) Isolation joint intended to allow independent movement between adjoining parts
    e. Isolation Joint: Separation between adjoining parts of concrete structure, usually vertical plane, at designated location such as to interfere least with performance of structure, yet such as to allow relative movement in three directions and avoid formation of cracks elsewhere in concrete and through which all or part of bonded reinforcement is interrupted.
11. Mud: Slang term for mortar.
12. Non-vitreous tile: Tile with water absorption of more than 7.0 percent.
13. Pavers: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker with 6 in.- or more of facial area. (ASTM C 242).
14. Sanded Cement Grout: Factory prepared mixture of cement, graded sand, and other ingredients to produce water-resistant, dense, uniformly colored material. Used for joints of 1/8 inch (3 mm) width or greater.
15. Static Coefficient of Friction (SCOF): Measures ratio of forces necessary to start two surfaces sliding. (older measurement of friction replaced by dynamic coefficient of friction (DCOF)).
16. Setting Bed: See Mortar Bed.
17. Tile:
    a. Ceramic Tile: Ceramic surfacing unit, usually relatively thin in relation to facial area, made from clay or mixture of clay; and other ceramic material, called body of the tile, having either 'glazed' or 'unglazed' face, and fired above red heat to temperature sufficiently high to produce specific physical properties and characteristics.
    b. Paver Tile: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker (usually 3/8 inch (9.5 mm) thick) with 6 inch (150 mm) or more of facial area. (ASTM C242).
    c. Porcelain Tile: Ceramic mosaic tile or paver that is generally made by dust-pressed method, of composition resulting in tile that is dense, fine-grained, and smooth with sharply formed face, usually impervious. (ASTM C242).
    d. Wall Tile: Glazed tile with body that is suitable for interior use and which is usually nonvitreous and is not required nor expected to withstand excessive impact.
18. Thin-set: Term used to describe bonding of tile with suitable materials applied approximately 1/8 inch thick.
19. Urethane: Elastomeric polymer with excellent chemical and water resistance.
20. Unsanded Cement Grout: Factory prepared mixture of cement and additives that provide water retentivity. Used for joints of 1/8 inch (3 mm) or less.
21. Vapor Retarder: Waterproof membrane placed under concrete floor slabs that are placed on grade.

22. Vitreous Tile: Ceramic tile with low porosity, used indoors or outdoors, in wet or dry locations.
23. Waterproof Membrane: Membrane to provide positive waterproof floor over substrate, which is to receive tile installation using a wire reinforced mortar bed.

C. Reference Standard:
1. American National Standards Institute:
   a. ANSI A108/A118/A136.1, 'American National Standards Specifications for the Installation of Ceramic Tile', Version 2013.1 (compilation of standards):
      1) Installation Standards:
         a) A108.01, 'General Requirements: Subsurfaces and Preparation by Other Trades'.
         b) A108.02, 'General Requirements: Materials, Environmental, and Workmanship'.
         c) A108.05, 'Installation of Ceramic Tile with Dry-Set Portland Cement Mortar of Latex-Portland Cement Mortar'.
         d) A108.6, 'Installation of Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy'.
         e) A108.10, 'Installation of Grout in Tilework'.
         f) A108.17, 'Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone'.
      2) Material Specifications:
         a) A118.1, 'Dry-Set Portland Cement Mortar'.
         b) A118.3. 'Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive'.
         c) A118.4, 'Latex Portland Cement Mortar'.
         d) A118.6, 'Cement Grouts for Tile Installation'.
         e) A118.7, 'High-Performance Polymer Modified Latex/Portland Cement Grouts for Tile Installation'.
         f) A118.10, 'Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations'.
         g) A118.12, 'Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installations'.
   b. ANSI A137.1-2012, 'National Standard Specifications for Ceramic Tile'.
2. ASTM International:
   a. ASTM A1064/A1064M-13, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
   b. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
   c. ASTM C150/C150M-12, 'Standard Specification for Portland Cement'.
   d. ASTM C206-03(2009), 'Standard Specification for Finishing Hydrated Lime'.
   e. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
   f. ASTM C242-14, 'Standard Terminology of Ceramic Whitewares and Related Products'.
   g. ASTM C373-14, 'Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products'.
   h. ASTM C482-02(2009), 'Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste'.
   i. ASTM C501-84(2009), 'Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser'.
   j. ASTM C648-04(2009), 'Standard Test Method for Breaking Strength of Ceramic Tile'.
   k. ASTM C847-12, 'Standard Specification for Metal Lath'.
3. International Organization for Standardization:
   a. ISO 13007-1:2010, ' Ceramic tiles - Grouts and adhesives - Part 1: Terms, definitions and specifications for adhesives'.
   b. ISO 13007-2:2010, ' Ceramic tiles - Grouts and adhesives - Part 2: Test methods for adhesives'.
   c. ISO 13007-3:2010, ' Ceramic tiles - Grouts and adhesives - Part 3: Terms, definitions and specifications for grouts'.
   d. ISO 13007-4:2010, ' Ceramic tiles - Grouts and adhesives - Part 4: Test methods for grouts'.
4. Tile Council of North America:
   a. TCNA B415-11, 'Wood or Metal Studs, Mortar Bed Walls, Mortar Bed Floor, Ceramic Tile'.
   b. TCNA F111-11, 'On-Ground or Above-Ground Concrete, Unbonded Mortar Bed, Ceramic Tile'.

c. TCNA F113-11, 'On-Ground or Above Ground Concrete, Ceramic Tile (Direct Bond w/Optional Membrane)'.
d. TCNA F115-11, 'On-Ground Concrete, Ceramic Tile, Epoxy or Furan Grout'.
e. TCNA F125a-11 'On Ground or Above Ground Concrete' – Crack Isolation Membrane – Ceramic Tile'.
f. TCNA W221-11, 'Solid Backing, Mortar Bed, Ceramic Tile'.
g. TCNA W244c-11, 'Wood or Metal Studs , Cement Backer Board, Ceramic Tile'.
h. TCNA W245-11, 'Wood or Metal Studs, Coated Glass Mat Water-Resistant Gypsum Backer Board, Ceramic Tile'.

1.3 SUBMITTALS

A. Action Submittals:
1. Samples:
a. 24 inch (600 mm) square sample on specified tile backer showing all types of tile, grout, and colors specified. 1/2 of sample board shall show floor tile and 1/2 shall show wall tile.
b. One sample of each type of base tile and trim piece to be used on Project.

B. Informational Submittals:
1. Certificates:
a. Master grade certificate.
1) Conform to ANSI A137.1.
2. Manufacturer's Instructions:
a. Provide instructions for installation of tile-setting materials.
3. Source Quality Control Submittals:
a. Provide Manufacturer documentation indicating proposed materials will satisfy requirements for Manufacturer's Warranty.
4. Qualification Statement. See Section 01 4301 for qualifications:
a. Installer:
1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Operations and Maintenance Data:
1) Cleaning and maintenance instructions.
b. Warranty Documentation:
1) Include copy of final, executed warranty.
c. Record Documentation:
1) Manufacturers Documentation:
a) Manufacturer's cut sheets of materials used in installed system.
b) Tile color and pattern selections.

1.4 QUALITY ASSURANCE

A. Source Of Materials:
1. Provide materials obtained from one (1) source for each type and color of tile, grout, and setting materials for Manufacture's system warranty.

B. Qualifications:
1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
a. Minimum three (3) years experience installing specified tile installations.
b. Minimum five (5) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
c. Upon request, submit documentation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver and store packaged materials in their original unopened containers with labels intact until time of use.

B. Storage and Handling Requirements:
   1. Store and handle materials in a manner to prevent damage or contamination by water, freezing, or foreign matter.
   2. Keep grade seals intact and cartons dry until tile are used.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not apply tile setting materials to surfaces that contain frost.
   2. Keep ambient temperatures of area to receive tile work and surface temperatures of substrates at 50 deg F (10 deg C) minimum during preparation of mortar bed, laying of tile, and for seventy two (72) hours after completion of tile work. Use electric heat to prevent discoloration of grout.
   3. Temperature of substrate shall be 60 deg F (15.6 deg C) and rising for application of epoxy and furan unless otherwise specifically authorized by Manufacturer.
   4. Maintain epoxy at stable temperature between 60 deg F (15.6 deg C)and 90 deg F (32 deg C) during curing period.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's twenty five (25) year minimum system warranty on tile-setting materials for surface preparation, setting materials and grouting materials; includes replacement of defective materials and replacement of tile, including labor and materials at original cost at time of installation.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
   1. Approved Manufacturer's:
      a. Custom Building Products, Seal Beach, CA www.custombuildingproducts.com.
      b. Crossville, Inc., Crossville, TN www.crossvilleinc.com
      c. Dal-Tile Corp., Div. of Mohawk Industries, Dallas, TX www.daltile.com.
      d. Laticrete International Inc., Bethany, CT www.laticrete.com.
      e. Mapei Americas Headquarters, Deerfield Beach, FL www.mapei.com.
      f. Merkrete, by Parex USA, Inc., Anaheim, CA www.merkrete.com.
      g. Schulter Systems L.P., Plattsburgh, NY www.schluter.com.

B. Design Criteria:
   1. General:
      a. Paver Tile: Standard grade porcelain tile, solid color throughout, graded in accordance with ANSI A137.1:
         1) Cove Base with external and internal corner pieces shall be standard grade.
      b. Ceramic Tile:
         1) Tile shall be standard quality, white or off-white body, square or cushion edge, graded in accordance with ANSI A137.1.
         2) Square edge, white body, lug type wall tile. Field wall tile shall have two lugs on each edge to assure uniform joint, approximately 0.040 inch (one mm).
         3) External and internal corner pieces shall be standard grade.

2. Capabilities:
   a. Paver Tile:
      1) Water Absorption when tested in accordance with ASTM C373: 0.1 to 0.5 percent.
      2) Abrasive Wear Resistance when tested in accordance with ASTM C501: 275 minimum.
      3) Breaking Strength when tested in accordance with ASTM C648: 300 lbs minimum.
      4) Bond Strength when tested in accordance with ASTM C482: 200 psi minimum.
      5) Coefficient of Friction: 0.42 minimum as measured by DCOF (Dynamic Coefficient of Friction) AcuTest method and requirements as per ANSI A137.1.

C. Description of Materials:
   1. Paver Tile:
      a. Tile Sizes:
         1) Floor Tile: 12 inches (300 mm) x 24 inches (600 mm)
         2) Cove Base: 6 inches by 12 inches (150 mm by 300 mm) with bull-nosed top:
            a) External and internal corner pieces to match with bull-nosed top.
         3) Wall Tile: 12 inches (300 mm) x 24 inches (600 mm)
         4) Bull Nose: 4 (100 mm) x 24 inches (600 mm
            a) External and internal corner pieces to match with bull-nosed top.
      b. Approved Colors.
         1) As selected by Architect.

D. Materials:
   1. Paver Floor Tile:
      a. Approved Products.
         1) Crossville, Inc
         2) Equal approved by Architect prior to bidding.
   2. Wall Tile:
      a. Approved Products.
         1) Crossville, Inc
         2) Equal approved by Architect prior to bidding.
   3. Wall Accent Tile:
      a. Approved Products.
         1) Empire Tile
         2) Equal approved by Architect prior to bidding.
   4. Mortar Bed:
      a. Portland Cement: Meet requirements of ASTM C150/C150M, Type 1, designation shall appear on bag.
      b. Hydrated Lime:
         1) Meet Requirements of one of following:
            a) ASTM C206.
            b) ASTM C207, Type S (designation shall appear on bag).
      c. Sand: Clean, washed, well-graded, meeting requirements of ASTM C144 with gradation of 100 percent passing No. 8 sieve with not over five (5) percent passing No. 100 sieve.
      d. Latex Additive: in lieu of all water:
         1) Meet warranty requirements.
         2) Meet requirements of ANSI A118.4.
         3) Acceptable Products:
            a) CUSTOM: Thin-Set Mortar Admix.
            b) LATICRETE: Latex Additive.
            c) MAPEI: Planicrete AC.
            d) MERKRETE: 150 Latex Admixture.
   5. Metal Trim:
      a. Approved Products.
         1) Tile / Carpet Junction: Schluter-RENO-AETK.
         2) Over Expansion Joints In Slabs: Schluter DILEX-BWS, color G, PG, or HB as selected by Architect.
   6. Joint Sealants:
      a. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
         1) Ceramic and paver cove base inside corners.

2) Ceramic and paver tile joints.

7. Backer Board Joint Reinforcing: 2 inch (50 mm) wide glass fiber mesh tape.
8. Tile Setting Products:
   a. Use only products of same Manufacturer to validate warranty, unless otherwise acceptable to Ceramic Tile Supplier.
   b. Latex-Portland Cement Mortar For Floors:
      1) Design Criteria:
         a) Meet Requirements of ANSI A118.4, ANSI A118.6, ANSI 118.11, or ANSI A118.15 and ISO 13007 C2ES1P2 for manufactured mortar.
      2) Approved Products. See Section 01 62 00 for definitions of Categories:
         a) CUSTOM: Megalite Thinset or FlexBond Fortified Thin-Set Mortar.
         b) LATICRETE: 254 Platinum Thinset.
         c) MAPEI: Ultraflex 3.
         d) MERKRETE: 735 Premium Flex.
   c. Latex/Polymer Modified Portland Cement Mortar For Walls:
      1) Meet Requirements of ANSI A118.4, ANSI A118.6, or ANSI A118.15 and ISO 13007; C2ES1P2 for manufactured mortar.
      2) Approved Products. See Section 01 6200 for definitions of Categories:
         a) CUSTOM: Megalite Thin-Set Mortar or FlexBond Fortified Thin-Set Mortar.
         b) LATICRETE: 254 Platinum Thinset.
         c) MAPEI: Ultraflex 3.
         d) MERKRETE: 735 Premium Flex.
   d. Floor Grout (Epoxy):
      1) Meet Requirements of ANSI A118.3 or ANSI A118.6 and ISO 13007 RG.
      2) Color:
         a) CUSTOM: No. 335 Winter Gray.
         b) Equal approved by Architect prior to bidding.
      3) Approved Products. See Section 01 6200 for definitions of Categories:
         a) CUSTOM: CEG-Lite 100% Solids Commercial Epoxy Grout.
   e. Wall Grout (Modified Polymer):
      1) Meet Requirements of ANSI A118.6 or ANSI A118.6 and ISO 13007.
      2) Color:
         a) CUSTOM: No. 543 Driftwood.
         b) Equal approved by Architect prior to bidding.
      3) Approved Products. See Section 01 6200 for definitions of Categories:
         a) CUSTOM: PolyBlend Non-Sanded Grout or Prism SureColor Grout.
         b) LATICRETE: 1600 Series Unsanded Dry Set Wall Grout with 1776 Grout Admix Plus additive.
         c) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.
         d) MERKRETE: Non-Sanded ColorGrout, latex modified.
   f. Waterproofing Membrane:
      1) Meet Requirements of ANSI A118.10.
      2) Approved Products. See Section 01 6200 for definitions for Categories:
         a) Troweled applied, cement based:
            (1) CUSTOM: FractureFree Crack Prevention Membrane.
            (2) LATICRETE: Hydro Ban.
            (3) MAPEI, Mapelastic 315.
            (4) MERKRETE: Hydro-Guard SP-1.
         b) Liquid applied, latex based:
            (1) CUSTOM: RedGard Waterproofing or Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
            (2) LATICRETE: Hydro Ban.
            (3) MAPEI: Mapelastic AquaDefense.
            (4) MERKRETE: Hydro-Guard SP-1.
   g. Crack Isolation Membrane:
      1) Meet Requirements of ANSI A118.12.
      2) Approved Products. See Section 01 6200.
         a) Flexible, thin, load-bearing, fabric-reinforced:
            (1) CUSTOM: Crack Buster Pro Crack Prevention Mat Underlayment, with Peel & Stick Primer.

(2) LATICRETE: Blue 92 Anti-Fracture Membrane.
(3) MAPEI, Mapeguard SM, and Primer SM.
(4) MERKRETE: Hydro-Guard SP-1.

b) Liquid applied, latex based:
(1) CUSTOM: RedGard Waterproofing and Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
(2) LATICRETE: Hydro Ban.
(3) MAPEI, Mapelastic AquaDefense.
(4) MERKRETE: Fracture Guard 5000.

h. Stone Thresholds:
1) Texture and color variation shall be within limits established by Architect's approved sample.
2) Free of defects that would materially impair strength, durability, and appearance.
3) Finish: 80 grit exterior hone.
4) White marble, one (1) piece, 7/8 inch (22 mm) thick by 2 1/2 inches (64 mm) by door opening width. Cross-section to meet handicap accessibility requirements.

E. Mixes:
1. Mortar Beds:

	Portland Cement	Dry Sand	Damp Sand	Hydrated Lime*
Floor Mix	One Part	5 Parts	4 Part	1/10 Part
Wall Mix	One Part	- -	5-1/2 to 7 Parts	1/2 Part

* Optional
** Use waterproofing admixture. Mix dry then add minimum amount of water.

PART 3 - EXECUTION:

3.1 INSTALLERS

A. Acceptable Installers:
1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. Verification Of Conditions:
1. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile.
2. Verify tile substrate is well cured, dry, clean, and free from oil or waxy films, and curing compounds.
3. Notify Architect in writing if surfaces are not acceptable to install tile:
a. Do not lay tile over unsuitable surface.
b. Commencing installation constitutes acceptance of surfaces and approval of existing conditions.

3.3 PREPARATION

A. Surface Preparation:
1. Allow concrete to cure for twenty eight (28) days minimum before application of mortar bed.
2. Repair and clean substrate in accordance with installation standards and manufacturer's instructions.

3.4 INSTALLATION

A. Interface With Other Work:

1. Grounds, anchors, plugs, hangers, door frames, electrical, mechanical, and other work in or behind tile shall be installed before tile work is started.

B. Special Techniques:
   1. Install in accordance with following latest TCNA installation methods:
      a. Flush Concrete Slabs with crack isolation membrane: TCNA F115.
      b. Mortar Bed on Concrete Slab: TCNA F111 with reinforcing.
      c. Framed Walls: TCNA W245 with waterproof membrane.
      d. Tile Cove Base: TCNA Flush style.

C. Tolerances:
   1. Plane of Vertical Surfaces:
      a. 1/8 inch in 8 feet (3 mm in 2.450 meters) from required plane shall be plumb and true with square corners.
   2. Variation In Slab Grade:
      a. Plus or minus 1/8 inch (3 mm) in any 10 feet (3.050 m) of floor slab and distance between high point and low point of slab of 1/2 inch (12.7 mm).
      b. Slab Testing Procedure:
         1) Place ends of straightedge on 3/8 inch (10 mm) high shims.
         2) Floor is satisfactory if 1/4 inch (6 mm) diameter steel rod rolled under straightedge will not touch anywhere along 10 foot (3.050 m) length and 1/2 inch (12.7 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot (3.050 m) length.

D. General:
   1. Install tile in pattern indicated:
      a. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
      b. Adjust to minimize tile cutting and to avoid tile less than half size.
      c. Center and balance areas of tile if possible.
   2. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption:
   3. Maintain heights of tilework in full courses to nearest obtainable dimension where heights are given in feet and inches (meters and millimeters) and are not required to fill vertical spaces exactly.
   4. Install cut tile with cuts on outer edges of field:
      a. Provide straight cuts that align with adjacent materials.
      b. When possible, smooth cut edges of tile or use appropriate cutter or wet saw to produce smooth cuts.
      c. Do not install tile with jagged or flaked edges.
   5. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment:
      a. Fit tile closely where edges are to be covered by trim, escutcheons, or similar devices.
   6. Provide straight tile joints of uniform width, subject to variance in tolerance allowed in tile size:
      a. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
   7. Use a beating block and hammer or rubber mallet so faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.
   8. Accessories in tilework shall be evenly spaced, properly centered with tile joints, and level, plumb, and true to correct projection.
   9. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

E. Application On Concrete Floor:
   1. On Mortar Bed:
      a. Apply mortar bed to depth equal to depression in slab minus 1/2 inch (12.7 mm).
      b. Properly cure before installing tile.
   2. Clean substrate surface thoroughly.
      a. Dampen if very dry, but do not saturate.
   3. Install tile with 100 percent contact with mortar bed.
      a. Obtaining 100 percent contact may require troweling mortar layer on back of each tile before placing on mortar bed.
   4. Install base by flush method (square or thin-lip method is not acceptable):

a. Allow for expansion joint directly above any expansion or control joints in slab.
5. Insert temporary filler in expansion joints.

F. Application On Walls:
1. On Glass Mat Gypsum Tile Backer Over Framing:
a. Embed fiberglass reinforcing tape at joints with mortar used to adhere tile.
2. Dampen dry backings as determined by environmental conditions and Manufacturer's recommendations to achieve cure.
3. Allow for sealant joints full height at room corners in wall tile. Insert temporary filler in expansion joints.
4. Install wall tile directly atop bull-nosed paver tile base.

G. Application Of Mortar:
1. Do not spread more mortar than can be covered within ten (10) to fifteen (15) minutes:
a. If 'skinning' occurs, remove mortar and spread fresh material.
b. Spread mortar with notches running in one (1) direction, perpendicular to pressing, pushing and pulling of tile during placement.
2. Install tile before mortar has started initial cure:
a. For thin set mortar application, use notch trowel that will achieve the recommended coverage of mortar after tiles have been installed.
3. Place tile in fresh mortar, press, push and pull tile slightly to achieve as near 100 percent coverage and contact of tile with setting material and substrate as possible:
a. Average contact area shall be not less than eighty (80) percent except on exterior installations where contact area shall be ninety five (95) percent when not less than three (3) tiles or tile assemblies are removed for inspection. The eighty (80) percent or ninety five (95) percent coverage shall be sufficiently distributed to give full support of the tile.
b. Support corners and edges with mortar leaving no hollow corners or edges.
4. Install so there is 1/8 inch (3 mm) of mortar between tile and substrate after proper bedding:
a. Periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
b. If coverage is found to be insufficient, use a larger size notch trowel.

H. Application Of Grout:
1. Firmly set tile before applying grout:
a. This requires forty eight (48) hours minimum.
2. Before grouting:
a. Remove all paper and glue from face of mounted tile.
b. Remove spacers or ropes before applying grouting:
3. Mixing Grout:
a. Use clean buckets and mixing tools:
1) Use sufficient pressure and flow grout in progressively to avoid air pockets and voids.
b. Machine mixing of grout is preferred to assure uniform blend. To prevent trapping air bubbles into prepared grout, use slow speed mixer.
c. Slake for fifteen (15) minutes.
d. Water or latex additives used for mixing with dry grout shall be measured accurately.
4. Before grouting entire area, do a test area to assure there will be no permanent staining or discoloration of tile and to verify that excess grout can be easily removed from tile surface:
a. If necessary, pre-coat exposed surfaces of tile with a grout release recommended by Grout Manufacturer to facilitate removal of excess grout.
5. Installing Grout:
a. Use caution, when grouting glazed ceramic tiles to prevent scratching or damaging surface of tile.
b. Dampen dry joints prior to grouting with sand-portland cement grout, standard sanded cement grout, standard unsanded cement grout, polymer modified sanded tile grout, and polymer modified unsanded tile grout. Do not leave puddles of water in joints before grouting.
c. Keep an adequate joint depth open for grouting. Force maximum amount of grout into joints.
d. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps
1) Fill joints of cushion edge tile to depth of cushion.
2) Fill joints of square edge tile flush with surface.
3) Fill joint between wall tile and bull-nosed paver tile base with floor grout.

e. Install floor tile with grout thickness of 3/16 inch (4.76 mm) maximum.
f. Remove excess grout from surface of tile before it loses its plasticity or begins to set.
g. Finished grout shall be uniform in color, smooth, and without voids, pin holes, or low spots.

I. Curing:
1. Keep installation at 65 to 85 deg F (18 to 30 deg C) during first eight (8) hours of cure. Shade area completely from sun during this period.

J. Application of Joint Sealants:
1. Apply joint sealants after grout has cured:
a. This requires forty eight (48) hours minimum.
2. Before applying sealant:
a. Remove spacers or ropes before applying joint sealants.
b. Apply backer rod and joint sealants at expansion joints.

3.5 FIELD QUALITY CONTROL

A. Non-Conforming Work:
1. Correct any work found cracked, chipped, broken, unbounded and otherwise defective or not complying with contract document requirements at no additional cost to the Owner.

3.6 CLEANING

A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter:
1. If a grout haze or residue remains, use a suitable grout haze remover or cleaner.
2. Flush surface with clean water before and after cleaning.

3.7 PROTECTION

A. Close to traffic areas where tile is being set and other tile work being done:
1. Keep closed until tile is firmly set.
2. Before, during, and after grouting, keep area clean, dry, and free from foreign materials and airflow that will interfere with setting and curing of grout.

B. Newly tiled floors shall not be walked on nor worked on without using kneeling boards or equivalent protection of tiled surface.

C. After cleaning, provide protective covering and maintain conditions protecting tile work from damage and deterioration:
1. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, cover protective covering with 1/4 inch (6 mm) hardboard, plywood, or similar material.

END OF SECTION

SECTION 09 5113
ACOUSTICAL PANEL CEILINGS CERAMAGUARD

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Sections

1. Section 09 51116 – Acoustical Tile Ceilings
2. Section 09 5323 - Acoustical Suspension Assemblies
3. Division 23 - HVAC Air Distribution
4. Division 26 - Electrical

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
12. ASTM E 1264 Classification for Acoustical Ceiling Products

B. California Building Code
C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality
D. NFPA 70 National Electrical Code
E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
G. International Code Council-Evaluation Services Report - Seismic Engineer Report
    1. ESR 1308 - Armstrong Suspension Systems
H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report
    1. 0244 - Armstrong Single Span Suspension System
I. California Department of Public Health CDPH/EHLB/Standard Method v1.2 2017
J. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).

1.4 SYSTEM DESCRIPTION

A. Continuous/Wall-to-wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6-inch x 6-inch samples of specified acoustical panel; 8-inch-long samples of exposed wall molding and suspension system, including main runner and 4-foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with or supported by the ceilings.
D. Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification, such as Underwriter’s Laboratory (UL), of NRC, CAC, and AC.

1. If the material supplied by the acoustical subcontractor does not have an independent laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of, and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer to ensure fit and function.

B. Installer Qualifications: Company specializing in performing specified work type, a minimum of three years of documented experience, and approved by the manufacturer.

C. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

D. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 Classification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure:

1. HumiGuard® Max ceiling panels are recommended for areas with maximum humidity, including outdoor applications. Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Max performance and hot dipped galvanized steel, aluminum or stainless-steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating.

1.9 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris.

B. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will help facilitate the process to recycle the ceiling.

C. Recycling may qualify for LEED Credits:

1. LEED 2009 - Category 4: Material and Resources (MR)
    i. Credit MRc2: Construction Waste Management
2. LEEDv4 - MRp2
    i. Construction Waste Management Planning Qualifies as a material stream (non-structural) targeted for diversion. Ceilings will be source-separated and diverted through the Armstrong Ceiling Recycling Program.
3. LEEDv4-MRc5
    i. Option 1: Divert ceilings to qualify for one of the 3 material streams (50%)
    ii. Option 2: Divert ceilings to qualify for one of the 4 material streams (75%)

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels with HumiGuard® Max and HumiGuard® Plus performance: sagging and warping
2. Acoustical panels with BioBlock® performance: growth of mold and mildew
3. Grid System: rusting and manufacturer's defects

B. Warranty Period:

1. Ceiling System: Thirty (30) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:
    1. Armstrong World Industries, Inc.
B. Suspension Systems:
    1. Armstrong World Industries, Inc.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panel Ceilings
    1. Surface Texture: Medium Texture
    2. Composition: Mineral Fiber
    3. Color: White
    4. Size: 24 in x 48 in
    5. Edge Profile: Square Lay-in
    6. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: N/A
    7. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; Classified with UL label on product carton: 40
    8. Flame Spread: ASTM E 1264; Class A
    9. Light Reflectance (LR) White Panel: ASTM E 1477; 0.86
    10. Dimensional Stability: HumiGuard Max
    11. Recycle Content: Up to 38% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
    12. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
    13. Indoor Air Quality Certified to SCS-105 v4.2-2023
    14. Basis of Design: CERAMAGUARD, as manufactured by Armstrong World Industries, Inc.

2.3 METAL SUSPENSION SYSTEMS

A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed,

capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

1. Structural Classification: ASTM C 635 Intermediate or Heavy Duty.
2. Color: White or match the actual color of the selected ceiling tile, unless noted otherwise.
3. Sustainability: Environmental Product Declaration (EPD), Health Product Declaration (HPD)
4. Basis of Design:
    i. Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
D. Edge Moldings and Trim as manufactured by Armstrong World Industries, Inc.
E. Accessories as manufactured by Armstrong World Industries, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (**Exception: HumiGuard Max Ceilings**)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
    1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.
B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
C. Suspend main beam from overhead construction with hanger wires spaced 4 feet on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

SECTION 09 5113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install acoustical ceiling panels for suspended acoustical ceilings as described in Contract Documents.

B. Related Requirements:
   1. Section 09 5323: 'Metal Acoustical Suspension Assemblies'.

1.2 REFERENCES

A. Association Publications:
   1. The Ceilings & Interior Systems Construction Association (CISCA), *Ceiling Systems Handbook*. 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
      a. Recommendations for direct hung acoustical tile and lay-in panel ceilings.

B. Definitions:
   1. Acoustical Panel: Form of a prefabricated sound absorbing ceiling element used with exposed suspension systems.
   2. Absorption: Materials that have capacity to absorb sound. Absorption is the opposite of reflection.
   3. Ceiling Attenuation Class (CAC): Rates ceiling's efficiency as barrier to airborne sound transmission between adjacent closed offices. Shown as minimum value, previously expressed as CSTC (Ceiling Sound Transmission Class). Single-figure rating derived from normalized ceiling attenuation values in accordance with classification ASTM E413, except that resultant rating shall be designated ceiling attenuation class. (Defined in ASTM E1414.) Acoustical unit with high CAC may have low NRC.
   4. Center Line: Line indicating midpoint of surface in either direction. Used as guide in starting ceiling.
   5. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
   6. Flame Spread Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.
   7. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
   8. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
   9. Underwriters Laboratories Inc.:
      a. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition September 10 2008'. (Revision: September 13, 2010).

1.3 SUBMITTALS

A. Action Submittals:
   1. Produce Data: Technical data for each type of acoustical ceiling unit required.
   2. Sample: Minimum 6 inch (150 mm) x 6 inch (150 mm) samples of specified acoustical panel.

B. Informational Submittals:
   1. Certificates:
      a. Manufacturer's certifications that products comply with specified requirements including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry approved independent laboratory classification of NRC, CAC, and AC.
   2. Test And Evaluation Reports:
      a. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final, executed copy of Warranty.
      b. Record Documentation:
         1) Manufacturers Documentation:
            a) Manufacturer's literature.
            b) Color and pattern selection.

D. Maintenance Material Submittals:
   1. Extra Stock Materials:
      a. Provide Owner with one (1) carton of each type of tile for future use.
         1) Packaged with protective covering for storage and identified with appropriate labels.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Fire-Test-Response Characteristics: As determined by testing identical ceiling tile applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Surface-Burning Characteristics:
         1) Ceiling tile shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
            a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
            b) Flash point: None.
         2) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
         3) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
   2. Store in cool, dry location, out of direct sunlight and weather, and at temperatures between 32 deg F (0 deg C) and 86 deg F (30 deg C).
   3. Handle acoustical ceiling panels carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
2. Installation shall be at temperatures between 32 deg F (0 deg C) and 86 deg F (30 deg C) or as per Manufacturer recommendations.

1.7 WARRANTY

A. Manufacturer's Warranty:
   1. Acoustical ceiling panels:
      a. Manufacturer’s warranty to be free from defects in materials and factory workmanship.
      b. Manufacturer’s warranty against sagging and warping.
      c. Manufacturer’s warranty against mold/mildew, and bacterial growth.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers Contact List:
   1. Armstrong World Industries, Lancaster, PA www.ceilings.com.
      a. Contact Information:
         1) For pricing and ordering of tile, contact Sherry Brunt / Phyllis Miller at (800) 442-4212, FAX 800-233-5598, or bpo_strategic_accounts@armstrong.com.
         2) For Strategic Account information, contact Randy Lay at (303) 775-1409 ralay@armstrong.com.
   2. USG Interiors Inc, Chicago, IL www.usg.com.

2.2 MATERIALS

A. Acoustic Ceiling Panels:
   1. Description:
      a. Color: White (surface factory-applied).
      b. Composition: Wet-formed mineral fiber.
   2. Design Criteria:
      a. Acoustics:
         1) Noise Reduction Coefficient (NRC): ASTM C423; 0.70 minimum.
         2) Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; 35 minimum.
      b. Antimicrobial Protection: Resistance against growth of mold/mildew.
      c. Classification:
         1) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 1 (nodular) or Form 4 (cast or molded), Pattern E1 (lightly textured).
      d. Fire Performance: As specified in Quality Assurance in Part 1 of this specification.
      e. Light Reflectance (LR): ASTM E1477; 0.83 minimum.
      f. Sag Resistance: Resistance to sagging in high humidity conditions.
      g. VOC: Low.
   3. Wide Face Design:
      a. Design Criteria:
         1) Grid Face: 15/16 inch (24 mm).
         2) Size: 24 inch x 24 inch x 3/4" (610 mm x 1220 mm x 19 mm).
         3) Edge profile: Angled Tegular:
      b. Type One Acceptable Product:
         1) Quality Standard:
            a) Cirrus, Item number 584 by Armstrong.
         2) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Inspect for defects in support that are not acceptable.
      a. All wet work (concrete, painting, and etc.) must be completed and dry.
      b. Temperature conditions within Manufacturer's written recommendation.
   2. Notify Architect of unsuitable conditions in writing.
      a. Do not install acoustical ceiling panels until defects in support or environmental conditions are corrected.

3.2 PREPARATION

A. Materials shall be dry and clean at time of application.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

B. Special Techniques:
   1. If recommended by Manufacturer, use tile one at a time from at least four (4) open boxes to avoid creating any pattern due to slight variations from box to box. Use tile from same color run in individual rooms to assure color match.
   2. Leave tile in true plane with straight, even joints.

3.4 FIELD QUALITY CONTROL

A. Non-Conforming Work:
   1. Remove and replace defective materials at no additional cost to Owner including, but not limited to following:
      a. Remove and replace damaged or broken acoustical ceiling panels.
      b. Remove and replace discolored acoustical ceiling panels to match adjacent.
      c. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 CLEANING

A. Clean exposed surfaces of acoustical ceiling panels, including trim, edge moldings, and suspension members.
   1. Comply with Manufacturer's written instructions for cleaning and touch up of minor finish damage.

B. Waste Management:
   1. Remove from site all debris connected with work of this Section.

END OF SECTION

SECTION 09 5323

METAL ACOUSTICAL SUSPENSION ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install metal acoustical suspension system as described in Contract Documents including:
      a. Suspension system framing.
      b. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Requirements:
   1. Section 09 5113: 'Acoustical Panel Ceiling'.
   2. Section 26 5100: 'Interior Lighting' for electrical fixtures installed in ceiling.
   3. Division 21: 'Fire Suppression' for sprinklers installed in ceiling.
   4. Division 23: 'Mechanical' for related sections for HVAC installed in ceiling.
   5. Division 26: 'Electrical' for related electrical work.
   6. Division 27: 'Communications' for related sound and video work.

1.2 REFERENCES

A. Association Publications:
   1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
      a. *'Ceiling Systems Handbook':* Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
      b. CISCA 0-2, *'Guidelines for Seismic Restraint for Direct*-hung Suspended Ceiling Assemblies (zones 0-2)' Covers Seismic Design Category C.
      c. CISCA 3-4, *'Guidelines for Seismic Restraint for Direct*-hung Suspended Ceiling Assemblies (zones 3-4)' Covers Seismic Design Category D, E, and F.
      d. *'Production Guide'*: Practical reference for ceiling systems and estimating costs.

B. Definitions:
   1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling, typically acoustical ceiling. Also may be designed to accommodate lighting fixtures or air diffusers.
   2. Clips: Several clip designs are available to suit applications such as fire resistance, wind uplift and impact. Fire-resistance rated designs have exact requirements, including mandatory use of hold down clips for acoustical panels or tiles weighing less than 1 lb per sq ft (4.9 kg per sq m). For rooms with significant air pressure differential from adjacent spaces, retention clips may be necessary to retain panels in place. Maintaining air pressure values may also require perimeter panel seals, typically closed cell foam gasket with adhesive on one side.
   3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
   4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
   5. Exposed Grid System: Structural suspension system for lay-in ceiling panels. Factory-painted supporting members are exposed to view. Exposed tee surfaces may be continuous or have integral reveal. Reveals are typically formed as channel or rail profiles extending down from tee leg.

6. Flange: Horizontal surface on face of tee, visible from below ceiling. Part of grid to which color cap is applied. Most grid system flanges are either 15/16 inch (24 mm) or 9/16 inch (14 mm).
7. Hanger Wires: Wire employed to suspend acoustical ceiling from existing structure. Standard material is 12 gauge (0.105 inch - 2.70 mm) galvanized, soft annealed steel wire, conforming to ASTM A641/A641M. Heavier gauge wire is available for higher load carrying installations, or situations where hanger wire spacing exceeds 4 feet (1.20 m) on center. Seismic designs or exterior installations subject to wind uplift may require supplemental bracing or substantial hanger devices such as metal straps, rods or structural angles.
8. Heavy-Duty Systems: Primarily used for installations in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for ordinary commercial structure.
9. Hold Down Clip: Mechanical fastener that snaps over bulb of grid system to hold ceiling panels in place.
10. Main Beam, Main Runner, Main Tee: Primary or main beams of type of ceiling suspension system in which structural members are mechanically locked together. Provide direct support for cross runners and may support lighting fixtures and air diffusers, as well as acoustical tile. Supported by hanger wires attached directly to existing structure; or installed perpendicular to carrying channels and supported by specially designed sheet metal or wire clips attached to carrying channels.
11. Splay Wires: Wires installed at angle rather than perpendicular to grid.
12. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.
13. Suspension System: Metal grid suspended from hanger rods or wires, consisting of main beams and cross tees, clips, splines and other hardware which supports lay-in acoustical panels or tiles. Completed ceiling forms barrier to sound, heat and fire. It also absorbs in-room sound and hides ductwork and wiring in plenum.
14. T-Bar: Any metal member of "T" cross section used in ceiling suspension systems.

C. Reference Standards:
1. American Society of Civil Engineers/Structural Engineering Institute:
   a. ASCE/SEI 7-10, ‘Minimum Design Loads for Buildings and Other Structures' (Section 9, ‘Earthquake Loads).
2. ASTM International:
   a. ASTM A568/A568M-15, ‘Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for’.
   b. ASTM C635/C635M-13a, ‘Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings’.
   c. ASTM C636/C636M-13, ‘Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels’.
   d. ASTM A641/A641M-09a(2014), ‘Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire’
   e. ASTM A653/A653M-15, ‘Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process’.
   f. ASTM A1008/A1008M-15, ‘Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable’
   g. ASTM B117-11, 'Standard Practice for Operating Salt Spray (Fog) Apparatus.
   h. ASTM C635/C635M-13a, ‘Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings’.
   i. ASTM C636/C636M-13, ‘Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels’.
   j. ASTM D610-08(2012), ‘Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces’.
   k. ASTM E580/E580M-14, ‘Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions’.
3. California Building Code 2016 edition:
   a. ‘Suspended Acoustical Ceilings’.
   b. ICC/ESR-1308 (Reissued December 2014), ‘Armstrong World Industries'.
4. Underwriters Laboratories / American National Standards Institute:
   a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).
   b. UL 723, ‘Standard for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression systems.
   2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
   2. Samples:
      a. Minimum 8 inch (200 mm) long samples of exposed wall molding and suspension system, including main runner/tee and cross runner/tee with couplings.

B. Informational Submittals:
   1. Certificates:
      a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
      b. Installer's certificates of training.
   2. Manufacturer's Instructions:
      a. Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. All system components conform to ASTM standards.
   2. Fire-Resistance Rating: UL approved metal suspension system.
   3. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
   4. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand the effects of earthquake motions according to the following:
      a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
      b. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's *'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2*' (Apply to Seismic Categories A & B).
      c. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's '*Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4'* (Apply to Seismic Categories C, D, E & F).

B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
   1. Installer:
      a. Installer training (Ceiling Masters training course or equivalent).
   2. Manufacturer:
      a. Manufacturer in good standing of CISCA (Ceiling and Interior Systems Construction Association).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.
   2. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Suspension system: Manufacturer warranty including repair or replacement of rusting as defined by ASTM D610 and defects in material or factory workmanship.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Category Four Acceptable Manufacturers. See Section 01 6200 for definition of Categories:
      a. Grid Face: 9/16 inch (14 mm).
         1) Armstrong World Industries, Lancaster, PA www.ceilings.com.
         2) USG Interiors Inc, Chicago, IL www.usg.com.

B. Materials:
   1. Grid:
      a. Systems shall meet requirements of ASTM C635/C635M, Heavy Duty suspension system required for Seismic Design Categories D, E, or F.
      b. Exposed surfaces shall be finished with factory-applied white baked enamel.
      c. Meet requirements of ASTM D610 for red rust.
      d. Main runners and cross tees:
         1) All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653/A653M. Main beams and cross tees are double-web steel construction with type exposed flange design.
         2) Narrow-face design - main runners and cross tees shall have 9/16 inch (14 mm) exposed face in a narrow revealed edge.
   2. Performance Standards:
      a. DXL Systems by USG Interiors required for Seismic Design Categories D, E, or F.
   3. Wire Hangers, Braces, and Ties:
      a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
      b. Size:
         1) Standard size: 12 gauge (0.105 inch) (2.70 mm) galvanized, soft annealed steel wire.
         2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than 12 gauge (0.105 inch) (2.70 mm).
      c. Protect with rust inhibitive paint.
   4. Wall Molding: Channel section of cold-rolled electro-galvanized steel.
   5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of same width as exposed runner.
   6. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.
   7. Seismic Joint Clip:
      a. Required for Seismic Design Categories D, E, or F.
      b. Quality Standard Product:
         1) SJCG by Armstrong World Industries, Lancaster, PA www.armstrong.com.
         2) Equal as approved by Architect before bidding. See Section 01 6200.

8. Seismic Suspension System:
    a. Required for Seismic Design Categories A, B, C, D, E, or F:
    b. Design Criteria:
        1) Installation of ceiling system must be as prescribed by ICC-ES Evaluation Reports ESR-1222 or ESR-1308 and applicable code.
        2) Meet requirements of ASTM A568/A568M for hot-dipped galvanized, cold-rolled steel.
        3) Attach cross runners to wall with seismic clips.
    c. Wall Molding Size: 7/8 inch (22 mm) for all seismic design categories (code approved).
    d. Category Four Acceptable Products. See Section 01 6200 for definition of Categories.
        1) ACM7 Clip by USG Inc, Chicago, IL www.usg.com.
        2) BERC-2 Clip by Armstrong World Industries, Lancaster, PA www.ceilings.com.
9. Compression Posts/Struts:
    a. Required for Seismic Design Categories D, E, or F.
    b. Meet seismic requirements for Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
    1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
        a. Work trades work to be thoroughly dry and complete prior to installation.
        b. Verify weather tightness of area to receive suspension system prior to installation.
    2. Notify Architect of unsuitable conditions in writing.
        a. Do not install ceiling panels until adverse conditions have been remedied.

3.2 INSTALLATION

A. Interface With Other Work:
    1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.

B. General:
    1. Install suspension system and panels in accordance with Manufacturer's written instructions, and in compliance with ASTM C636/C636M, and with authorities having jurisdiction (AHJ).

C. Lay out suspension system symmetrically about center lines of room unless shown otherwise by Contract Drawings. Lay out system so use of tiles less than 1/2 size is minimized.

D. Suspend main runner/tee from overhead construction with hanger wires spaced 4 feet (1.20 m) on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.

E. Maintain suspension system in true plane with straight, even joints.

F. Suspension system joints shall be straight and in alignment, and exposed surface flush and level. Wherever system abuts walls, columns, and other vertical surfaces, furnish and install appropriate molding.

G. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

H. Support edges with wall moldings.

I. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room insofar as possible (unless shown otherwise). Locate fixtures, speakers, diffusers, and grilles within suspension grid spaces and centered at least one (1) direction within grid. Installed fixtures shall not compromise ceiling performance.

J. Pay particular attention to required hanger wire placement and fixture protection. Individual component deflection not to exceed 1/360 of span.

K. Nails installed vertically into bottom of structural members, which are subject to pullout, shall not be used to support metal acoustical suspended assemblies:
   1. Nails may be used when installed horizontally into sides of structural members.
   2. Embedment must be at least 5/8 inch (15.9 mm).

L. Screws, eyebolts or lag bolts used to support metal acoustical suspended assemblies must have minimum embedment of 5/8 inch (15.9 mm) when installed into structural members.

3.3 FIELD QUALITY CONTROL

A. Field Inspections:
   1. Inspect:
      a. Suspended ceiling system.
      b. Hangers, anchors and fasteners.

B. Non-Conforming Work:
   1. Correct any work found defective or not complying with contract document requirements at no additional cost to Owner.

END OF SECTION

SECTION 09 6513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But not Installed Under this Section:
   1. Resilient base as described in Contract Documents.

B. Related Requirements:
   1. Section 09 6519: 'Resilient Tile Flooring' for installation of resilient base and accessories.

1.2 REFERENCES

A. Definitions:
   1. Flame Spread: Propagation of flame over a surface.
   2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
   3. Resilient Wall Base Classification:
      a. Type:
         1) TS: Rubber, vulcanized thermoset.
         2) TP: Rubber, thermoplastic.
         3) TV: Vinyl, thermoplastic.
      b. Group:
         1) Group 1: Solid (homogeneous).
         2) Group 2: Layered (multiple layers).
      c. Styles:
         1) Style A: Straight.
         2) Style B: Cove.
         3) Style C: Butt-to.
   4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.

B. Reference Standards:
   1. ASTM International:
      a. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
      b. ASTM F1861-16, 'Standard Specification for Resilient Wall Base'.
   2. Underwriters Laboratories, Inc.:
      a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate completion of resilient base and accessories installation with other trades.

B. Pre-Installation Conference:
   1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6813 and Section 09 6816 pre-installation conference.
   2. In addition to agenda items specified in Section 01 3100 and Section 09 0503, review following:
      a. Review if stairs are included for Project.
      b. Review if stair skirts are included for Project.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's literature or cut sheet on base and adhesive.
      b. Color selection.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Fire-Test-Response Characteristics:
      a. Surface-Burning Characteristics:
         1) Base shall have Class B flame spread rating in accordance with ASTM E84 or UL 723.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage and Handling Requirements:
   1. Store materials in dry space protected from weather at not less than 55 deg F (12.8 deg C) or more than 85 deg F (29.4 deg C) or as per Manufacturer's recommendation.
   2. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Store materials at not less than 70 deg F (21 deg C) for at least twenty four (24) hours before installation.
   2. Do not apply in temperatures below 70 deg F (21 deg C).

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
   1. Manufacturers Contact List:
      a. Burke Flooring, San Jose, CA www.burkemercer.com.

B. Materials:
   1. Wall Base:
      a. General:
         1) Size:
            a) Minimum body thickness: 1/8 inch by 4 inch (3 mm by 100 mm).
            b) Length: not less than normal.
         2) Corners:
            a) Use preformed, molded external corners for both inside and outside corners.
            b) Butt joint interior corners.
            c) Corners must meet same height and thickness requirements as wall base.
      b. Design Criteria:
         1) Meet requirements of ASTM F1861, Type TP or TS, Group 1 (solid), Style B (cove).
         2) Free from objectionable odors, blisters, cracks, and other defects affecting appearance or serviceability of rubber, and not containing fabric.

3) Style: Coved.
c. Colors:
1) Color pigments used shall be highly fade-resistant, insoluble in water, and resistant to light, alkali, and cleaning agents.
2) Colors as selected by Architect from Manufacturer's standard colors:
2. Adhesive:
a. Use products recommended by Manufacturer for conditions of use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Inspect surfaces for conditions not suitable for installation. Surface to receive specified items shall be sound, clean, free from foreign matter, tightly nailed, and dry.
2. Notify Architect of unsuitable conditions in writing:
a. Do not start work until defects are corrected.
3. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

A. Surface Preparation:
1. Remedy cracks and minor irregularities in substrate in accordance with Manufacturer's recommendations.

3.3 INSTALLATION

A. Base:
1. Install in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned.
2. Fit specified items tightly. Use fillers where necessary. Fit neatly against projections, piping, electrical service outlets, etc.
3. Secure specified items with specified adhesive. Cement substantially to vertical surfaces including rubber base to cabinet work base.
4. Line up top and bottom lines of base throughout.
5. Do not stretch base during installation.
6. Roll until firm bond has been established. Leave level, free from buckles, cracks, and projecting edges.
7. In wall runs longer than 12 inches (300 mm), install no lengths of base shorter than 12 inches (300 mm) long.

3.4 FIELD QUALITY CONTROL

A. Non-Conforming Work:
1. Replace damaged materials at no additional cost to Owner.
2. Damaged materials are defined as having cuts, gouges, scrapes or tears, and not fully adhered.

3.5 CLEANING

A. General:
1. Base:
a. Clean all exposed surfaces of base of adhesive spatter before it sets in accordance with Manufacturer’s cleaning instructions.
b. Damp-mop surfaces to remove marks and soil.

2. Adjacent Work:
   a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.

3.6 PROTECTION

A. Base:
   1. Cover material until Substantial Completion.
   2. Keep traffic away until adhesive has set.

END OF SECTION

SECTION 09 6519

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install resilient tile flooring as described in Contract Documents.

B. Related Requirements:
   1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
   2. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
   3. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
   4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   5. Section 01 7800: 'Closeout Submittals'.
   6. Section 03 3111: Provision of acceptable concrete substrate.
   7. Section 07 2616: Installation of below grade vapor retarder.
   8. Section 09 0503: Floor substrate preparation.

1.2 REFERENCES

A. Association Publications:
   1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
      a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).

B. Reference Standards:
   1. ASTM International:
      a. ASTM F710-11, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.'
      b. ASTM F2170-09, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate completion of flooring installation with other trades.

B. Pre-Installation Conference: In addition to agenda items specified in Section 01 3100, review following:
   1. Participate in Pre-Installation Conference specified in Section 09 0503.
   2. In addition to agenda items specified in Section 01 3100, review following:
      a. Schedule conference after substrate preparation and TWO weeks before installation of flooring system.
      b. Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
         1) See Section 09 0503 for Options if concrete moisture tests of concrete slab exceeds Alkalinity and Concrete Moisture requirements for flooring.
   3. Review Flooring Manufacturer's installation conditions verification procedure and requirements.

4. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and flooring installation.

C. Scheduling:
1. Notify Testing Agency and Architect two weeks minimum before Pre-Installation Conference to allow testing for Alkalinity and Concrete Moisture of concrete slab.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
a. Manufacturer's literature or cut sheet on each component of system.
b. Maintenance instructions.
c. Color and style selection.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Manufacturers documentation:
a) Manufacturer’s literature.
b) Color and style selection.
2) Testing and Inspection Reports:
a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

C. Maintenance Material Submittals:
1. Extra Stock Materials:
a. Leave box of 20 extra tile of each pattern and color used on Project with Owner.

1.5 FIELD CONDITIONS

A. Ambient Conditions:
1. Building Conditions:
a. Conditions inside building shall be brought to levels to be normal at occupancy of building.
b. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
2. Concrete Slab:
a. General:
1) Final determination as to whether or not a concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing.
b. Alkalinity:
1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
c. Concrete Moisture Vapor Emission Rate (MVER):
1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
2) Do not install sheet carpeting if moisture vapor emission rate (MVER) of concrete slab relative humidity (RH) exceeds 75% as per ASTM F2170. Corrective procedures are required.
3. Application:
a. Maintain 70 deg F (21 deg C) minimum during application.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:
    a. Patcraft: PO Box 2128, Dalton, GA 30722 – 2128 800-241-4014 info@patcraft.com
    b. Equals as approved by architect prior to bidding.

B. Materials:
1. Reinforced Vinyl Tile:
    a. Product: 24 inch by 24 inches square - Verify size with Architect.
        1. Typography – Tab 00730
    b. Meet or exceed Fed Spec SS-T-312b, Type IV.
        1) Equals as approved by Architect before bidding. See Section 01 6200.
2. Adhesive: Water-resistant type. Best grade in accordance with Tile Manufacturer's recommendations.
3. Moisture Barrier Sealer: Moisture resistant type. Manufacturer S3 Surface Solutions product MRP Moisture Resistant Plus or equal. Apply product to slab if moisture levels exceed floor tile Manufacturer's criteria for installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.

B. Evaluation And Assessment:
1. Variation In Grade: Plus or minus 1/8 inch (3 mm) in any 10 feet (3 meters) of floor slab and distance between high point and low point of slab of 1/2 inch (12 mm).
2. Testing Procedure: Place ends of straightedge on 3/8 inch (9 mm) high shims. Floor is satisfactory if 1/4 inch (6 mm) diameter steel rod rolled under straightedge will not touch anywhere along 10 foot (3 meter) length and 1/2 inch (12 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot (3 meter) length.
3. Notify Architect in writing if floor surface is not acceptable to install tile. Do not lay tile over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.
4. Confirm acceptance and approval of substrate with Architect before beginning installation of flooring system.

3.2 INSTALLATION

A. Special Techniques:
1. Lay tile symmetrically about center line of spaces to insure even borders, unless shown differently on Drawings.
2. Install beveled edge stripping at terminal edges of tile except at ceramic tile, carpet, and where Drawings indicate different detail. Conceal edging strips beneath doors.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
1. Comprehensive Moisture Testing: Test for moisture in concrete slab when known moisture problems exist such as high-water table, or when RH testing alone does not provide adequate understanding of concrete slab moisture conditions that may adversely affect flooring material.

END OF SECTION

SECTION 09 6723

RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.

1. Application Method: Metal, power or hand troweled.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.

C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy mortar based system with decorative quartz topping). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.

a. Include 48-inch (1200-mm) length of integral cove base.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference:

1. General contractor shall arrange a meeting not less than thirty days prior to starting work.

2. Attendance:

a. General Contractor

b. Architect/Owner's Representative.

c. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cure. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include,

1. Must comply with troweled mortar base with broadcast topping. Liquid rich, slurry type systems will not be accepted, and will result in a disqualification from bid.

B. Acceptable Manufactures,

1. Stonhard Basis of design.

C. Products: Subject to compliance with requirements:

1. Stonhard, Inc.; Stonshield HRI®.

D. System Characteristics:

1. Color and Pattern: Choose from Mfg. Standards
2. Wearing Surface: Standard or medium.
3. Integral Cove Base: 6” with 1” cove radius
4. Overall System Thickness: nominal 3/16”

E. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:

   a. Material Basis: Stonhard Standard Primer
   b. Resin: Epoxy
   c. Formulation Description: (2) two component, 100 percent solids.
   d. Application Method: Squeegee and roller.
   e. Number of Coats: (1) one.

2. Mortar Base:

   a. Material design basis: Stonshield HRI Base
   b. Resin: Epoxy.
   c. Formulation Description: (3) three component, 100 percent solids.
   d. Application Method: Metal Trowel.
      1) Thickness of Coats: nominal 1/8" (inch).
      2) Number of Coats: One.
   e. Aggregates: Pigmented Blended aggregate.

3. Undercoat:

   a. Material Basis: Stonshield undercoat.
   b. Resin: Epoxy
   c. Formulation Description: (2) two-component, 100% solids, UV Stable.
   d. Type: Clear.
   e. Finish: Gloss.
   f. Number of Coats: one.

4. Broadcast Media:

   a. Material Basis: Stonshield quartz aggregate
   b. Type: pigmented.
   c. Finish: standard.
   d. Number of Coats: one.
   e. Pattern: Tweed.

5. Sealer:

   a. Material Basis: Stonkote CE4.
   b. Resin: Epoxy
   c. Formulation Description: (2) two-component, 100% solids, UV Stable.
   d. Type: Clear.
   e. Finish: Gloss.
   f. Number of Coats: one.
   g. Texture level: Standard or medium.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the

Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
   1. Compressive Strength: 10,000 psi after 7 days per ASTM C579
   2. Tensile Strength: 2,000 psi per ASTM C307
   3. Flexural Strength: 4,300 psi per ASTM C580
   4. Flexural Modulus of Elasticity: 2.0 x 10^6 psi per ASTM C580
   5. Hardness: 85 to 90 per ASTM D2240, Shore D
   6. Impact Resistance: > 160 in./lbs. per ASTM D2794
   7. Abrasion Resistance: 0.06 gm max. weight loss per ASTM D 4060, CS-17
   8. Flammability: Class 1 per ASTM E-648.
   9. Thermal Coefficient of Linear Expansion: 1.3 x 10^{-5} in./in. ^oF
   10. Water Absorption: 0.1% per ASTM C 413
   11. VOC Content per ASTM D2369:
      a. Stonshield HRI Base – 40 g/l
      b. Stonshield Undercoat – 34 g/l
      c. Stonkote CE4 – 34 g/l
   12. Cure Rate @ 77^{o}F/25^{o}C: 12 hours foot traffic, 24 hours normal operations

2.2 ACCESSORY MATERIALS

A. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

   1. Mechanically prepare substrates as follows:

      a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup, or Diamond Grind with dust free system.

   2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
   3. Verify that concrete substrates meet the following requirements.

a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 6 lb of water/1000 sq. ft. of slab in 24 hours.
c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Integral Cove Base: Stonshield cove mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.

1. Integral Cove Base: 6” inches high with 1” radius cove.

C. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

D. Apply metal trowel single mortar coat in thickness indicated for flooring system into wet primer. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

E. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

F. Broadcast: Immediately broadcast quartz silica aggregate into the undercoat using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

G. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS

A. Chase edges to “lock” the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General contractor is responsible for cleaning prior to inspection.

END OF SECTION

SECTION 09 9001

COMMON PAINTING AND COATING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common procedures and requirements for field-applied painting and coating.

B. Related Requirements:
   1. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of shop priming of steel and iron.
   2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of Elastomeric Joint Sealants.
   3. Sections under 09 9000 heading ‘Paints and Coatings’.
      a. Pre-Installation conferences held jointly with Section 09 9001.
   4. Divisions 22 and 23: Painting of plumbing and HVAC identification, refrigerant line insulation, and duct interiors.
   5. Section 32 1723: ‘Pavement Marking’.

1.2 REFERENCES

A. Definitions:
   1. Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
   2. Gloss Levels:
      a. Specified paint gloss level shall be defined as sheen rating of applied paint, in accordance with following terms and values, unless specified otherwise for a specific paint system.

Gloss Level ‘1’	Traditional matte finish - flat	0 to 5 units at 60 degrees to 10 units maximum at 85 degrees.
Gloss Level ‘2’	High side sheen flat - 'velvet-like' finish	10 units maximum at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level ‘3’	Traditional 'eggshell-like finish	10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level ‘4’	'Satin-like' finish	20 to 35 units at 60 degrees and 35 units minimum at 85 degrees.
Gloss Level ‘5’	Traditional semi-gloss	35 to 70 units at 60 degrees.
Gloss Level ‘6’	Traditional gloss	70 to 85 units at 60 degrees.
Gloss Level “7’	High gloss	More than 85 units at 60 degrees.

   3. Properly Painted Surface:
      a. Surface that is uniform in appearance, color, and sheen and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, spatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of 5 feet (1.50 m) minimum under normal lighting conditions and from normal viewing position (MPI(a), PDCA P1.92).
   4. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.

B. Reference Standards:
   1. The latest edition of the following reference standard shall govern all painting work:

a. MPI(a), 'Architectural Painting Specification Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
   a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
   b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
   c. Conference to be held at same time as Section 09 2900 to review gypsum board finish preparation.
2. In addition to agenda items specified in Section 01 3100, review following:
   a. Review Quality Assurance for Approval requirements.
   b. Review Quality Assurance Field Sample requirements.
   c. Review Submittal requirements for compliance for MPI Approved Products.
   d. Review Design Criteria requirements.
   e. Review Cleaning requirements.
   f. Review painting schedule.
   g. Review safety issues.
3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
   a. Include following information for each painting product, arranged in same order as in Project Manual.
      1) Manufacturer's cut sheet for each product indicating ingredients and percentages by weight and by volume, environmental restrictions for application, and film thicknesses and spread rates.
      2) Provide one (1) copy of 'MPI Approved Products List' showing compliance for each MPI product specified.
         a) MPI Information is available from MPI Approved Products List using the following link: http://www.paintinfo.com/mpi/approved/index.shtml.
      3) Confirmation of colors selected and that each area to be painted or coated has color selected for it.
2. Samples: Provide two 4 inch by 6 inch (100 mm by 150 mm) minimum draw-down cards for each paint or coating color selected for this Project.

B. Informational Submittals:
1. Manufacturer Instructions:
   a. Manufacturer's substrate preparation instructions and application instruction for each painting system used on Project.
2. Qualification Statement:
   a. Applicator:
      1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
   a. Record Documentation:
      1) Manufacturer's documentation:
         a) Manufacturer's cut sheet for each component of each system.
         b) Schedule showing rooms and surfaces where each system was used.

D. Maintenance Materials Submittals:
   1. Extra Stock Materials:
      a. Provide painting materials in Manufacturer's original containers and with original labels in each color used. Label each can with color name, mixture instructions, date, and anticipated shelf life.
      b. Provide one (1) quart of each finish coat and one (1) pint of each primer and of each undercoat in each color used.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approval:
   1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
   2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
   3. Master Painters Institute (MPI) Standards:
      a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
      b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.

B. Qualifications:
   1. Applicator:
      a. Minimum five (5) years' experience in painting installations.
      b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
      c. Maintain qualified crew of painters throughout duration of the Work.
      d. Upon request, submit documentation.

C. Field Samples:
   1. Before application of any paint system, meet on Project site with Architect, Owner's representative, and Manufacturer's representative. Architect may select one (1) surface for application of each paint system specified. This process will include establishing acceptable substrate conditions required for Project before application of paints and coatings.
   2. Apply paint systems to surfaces indicated by Architect following procedures outlined in Contract Documents and Product Data submission specified above.
   3. After approval of samples, proceed with application of paint system throughout Project. Approved samples will serve as standard of acceptability.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
   2. Deliver amount of materials necessary to meet Project requirements in single shipment.
   3. Notify Architect two working days before delivery of coatings.

B. Storage and Handling Requirements:
   1. Store materials in single place.
   2. Keep storage area clean and rectify any damage to area at completion of work of this Section.
   3. Maintain storage area at 55 deg F (13 deg C) minimum.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product for both interior and exterior work.

2. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted.
   a. Inspection of painting work shall take place under same lighting conditions as application.
   b. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Performance:
   1. Design Criteria:
      a. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
      b. All materials, preparation and workmanship shall conform to requirements of 'Architectural Painting Specification Manual' by Master Painters Institute (MPI).
      c. All paint manufacturers and products used shall be as listed under Approved Product List section of MPI Painting Manual.
      d. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
      e. Where specified paint system does not have Premium Grade, provide Budget Grade.
      f. Provide products of same manufacturer for each coat in coating system.
      g. Where required to meet LEED (Leadership in Energy and Environmental Design) program requirements, use only MPI listed materials having an "L" rating designation.
      h. Color Levels:
         1) Color Level II:
            a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
            b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
         2) Color Level III:
            a) Number and placement of interior and exterior paint colors and gloss levels shall be Color Level III from MPI Manual, PDCA P3-93 as modified in following paragraph.
            b) Several paint colors or gloss levels will be selected for same substrate within designated interior rooms or exterior areas.

B. Materials:
   1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
   2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

PART 3 - EXECUTION

3.1 APPLICATORS

A. Approved Applicators.

1. Approved painting company shall be pre-approved and included in Construction Documents by Addendum.

3.2 EXAMINATION

A. Verification of Conditions:
   1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections and are complete and ready for application of painting and coating systems as specified in those Sections.

B. Pre-Installation Testing:
   1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
   2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
   3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.

C. Evaluation and Assessment:
   1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

3.3 PREPARATION

A. Protection of In-Place Conditions:
   1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
      a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.

B. Surface Preparation:
   1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
   2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
   3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
   4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
   5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.

3.4 APPLICATION

A. Interface with Other Work:
   1. Coordinate with other trades for materials and systems that require painting before installation.
   2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.

B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.

1. Finish casework and wood trims that are specified to be installed under Section 06 2001 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.
2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
   a. Gas pipe from gas meter into building.
   b. Mechanical flues and pipes penetrating roof.
   c. Electrical panel and disconnect enclosures.
3. Metal reveals at ceiling access doors.
4. Paint inside of chases in occupied spaces flat black for 18 inches (450 mm) or beyond sightline, whichever is greater.

C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9213.

D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.

E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.

F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.

G. Touch up suction spots after application of first finish coat.

H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.

I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.

J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.

K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

3.5 FIELD QUALITY CONTROL

A. Non-Conforming Work:
1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.6 CLEANING

A. General:
1. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.

B. Waste Management:
1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.

3. Remove debris caused by work of paint Sections from premises and properly dispose.
4. Retain cleaning water and filter out and properly dispose of sediments.

END OF SECTION

SECTION 09 9112

EXTERIOR PAINTED FERROUS METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing and painting new exterior ungalvanized iron and steel surfaces as described in Contract Documents.

B. Related Requirements:
   1. Section 09 9001: 'Common Painting And Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.
      b. 'Attachment: Paint Color Schedule' for Southwest Gas Corporation Project.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Category Four Approved Products and Manufacturers.

B. Description:
   1. New Surfaces: Use MPI(a) EXT 5.1M Waterborne Light Industrial Coating system.

C. Design Criteria:
   1. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
   2. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
   3. Gloss / Sheen Level Required: Gloss Level 5.

D. Materials:
   1. All paints and coatings.
      a. Primer Coat: MPI Product 107, ‘Primer, Rust-Inhibitive, Water Based’.
      b. Finish Coats: MPI Product 163, ‘Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).
   2. Traffic signage:
      a. Primer Coat: MPI Product 107, ‘Primer, Rust-Inhibitive, Water Based’.
      b. Finish Coats: MPI Product 163, ‘Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).

PART 3 - EXECUTION

3.1 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

B. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and welding spatters, burrs, flux, slag, and fume. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.

END OF SECTION

SECTION 09 9113

EXTERIOR PAINTED GALVANIZED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing and painting new exterior exposed galvanized metal surfaces as Described in Contract Documents.

B. Related Requirements:
   1. Section 09 9001: 'Common Painting And Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Category Four Approved Products and Manufacturers.
      a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.

B. Description:
   1. Handrails And Exposed Miscellaneous Structural Steel:
      a. New Surfaces: Use MPI(a) EXT 5.3D Pigmented Polyurethane Finish system.
   2. All Other:
      a. New Surfaces: Use MPI(a) EXT 5.3H Latex Finish system.

C. Performance:
   1. Design Criteria:
      a. New Surfaces: MPI Premium Grade finish requirements.
      b. Gloss / Sheen Level Required: Gloss Level 5.

D. Materials:
   Polyurethane:
      a. Vinyl Wash Primer Coat: MPI Product 80: ‘Primer, Vinyl Wash’.
      b. Finish Coats:
         1) Epoxy MPI Product 101: ‘Primer, Epoxy, Anti-Corrosive, for Metal’.
         2) Polyurethane MPI Product 72: ‘Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)’.
   2. Latex:
      a. Waterborne Primer Coat: MPI Product 134: ‘Primer, Galvanized, Water Based’.
      b. Finish Coats: MPI Product 11: ‘Latex, Exterior Semi-Gloss (MPI Gloss Level 5)’.

PART 3 - EXECUTION

3.1 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

B. New Surfaces:
   1. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP1.
   2. After removal of 'passivated' or 'stabilized' coating or for surfaces without coating, clean surfaces to be painted with mineral spirits or product recommended by Paint Manufacturer. Change to clean rags or wiping cloths regularly to reduce possibility of re-contamination of surface.
   3. Apply prime coat.
   4. Apply finish coats.

END OF SECTION

SECTION 09 9114

PAINTED CMU AND CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing and painting new exterior masonry, concrete, and stucco surfaces as described in Contract Documents.

B. Related Requirements:
   1. Section 09 9001: 'Common Painting and Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Approved Products and Manufacturers. See Section 01 6200.
      a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.

B. Description:
   1. Concrete:
      a. New Surfaces: Use MPI(a) EXT 3.1D Epoxy Finish system.
   2. CMU:
      a. New Surfaces: Use MPI(a) EXT 4.2E Epoxy Finish system.

C. Performance:
   1. Finish Requirements:
      a. New Surfaces: MPI Premium Grade finish requirements.
      b. Gloss / Sheen Level Required: Gloss Level 1.

D. Materials:
   1. Block Filler, New CMU Only: MPI Product 4: ‘Block Filler, Epoxy, Interior/Exterior’.
   2. Epoxy Finish Coats: MPI Product 10: ‘Latex, Exterior Flat (MPI Gloss Level 1-2)’.

PART 3 - EXECUTION

3.1 PREPARATION

A. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.

3.2 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

B. New Surfaces:
   1. On highly porous surfaces when weather is exceptionally hot and dry, it may be desirable to dampen surface before applying first coat of an emulsion paint.
   2. Completely cover voids in masonry block.
   3. Roll after spraying if necessary, to eliminate pin holing.

END OF SECTION

SECTION 09 9122

INTERIOR PAINTED CMU

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing and painting new interior CMU walls as described in Contract Documents.

B. Related Requirements:
   1. Section 09 9001: 'Common Painting And Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturer:
   1. Approved Products and Manufacturers. See Section 01 6200.
      a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.

B. Description:
   1. Interior CMU surfaces as indicated on draqwings:
      a. New Surfaces: Use MPI(a) INT 4.2F Waterborne Epoxy Finish system.

C. Performance:
   1. Design Criteria:
      a. New Surfaces: MPI Premium Grade finish requirements.
      b. Gloss / Sheen Level Required: Gloss Level 5.

D. Materials:
   1. Block Filler, Over New Masonry Only: MPI Product 4: ‘Block Filler, Latex, Interior/Exterior’.
   2. Finish Coats: MPI Product 141: ‘Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)’.

PART 3 - EXECUTION

3.1 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

END OF SECTION

SECTION 09 9123

INTERIOR PAINTED GYPSUM BOARD, PLASTER

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing, priming, and finish painting new interior gypsum board and plaster surfaces as described in Contract Documents.

B. Related Requirements:
   1. Section 09 2900: 'Gypsum Board'
   2. Section 09 9001: 'Common Painting And Coating Requirements':
   3. Section 09 9413: 'Interior Textured Finishing' for textured finishes.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Approved Manufacturers and Products. See Section 01 6200.
      a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.

B. Description:
   1. Interior walls as indicated on drawings:
      a. New Surfaces: Use MPI(a) INT 9.2F Waterborne Epoxy Finish system.
   2. Administrative offices areas:
      a. New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.

C. Performance:
   1. Design Criteria:
      a. New Surfaces: MPI Premium Grade finish requirements.
      b. Gloss / Sheen Required:
   2. Rest Rooms, Break room, Custodial Rooms: Gloss Level 6.
   3. Remaining Painted Surfaces: Gloss Level 5.

D. Materials:
   1. Primers:
      a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
   2. Finish Coats:
      1) Rest Rooms, Break room And Custodial Rooms: Buildings with only Gypsum Board surfaces in rooms:
         a) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)'.
      b. Remaining Painted Surfaces:
         1) MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

B. Interface With Other Work: Properly clean and paint light cove interiors before installation of light fixtures.

C. New Surfaces:
   1. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.

END OF SECTION

SECTION 09 9124

INTERIOR PAINTED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
   1. Preparing and painting new interior metal surfaces as described in Contract Documents.

B. Related Requirements:
   1. Section 05 5871: 'Metal Brackets'.
   2. Section 09 9001: 'Common Painting and Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.
   3. Section 23 0553: 'I. D. For HVAC Piping and Equipment’ for field painting requirements of HVAC piping and equipment.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

B. Sequencing:
   1. Paint brackets furnished under Section 05 5871 before installation of bracket.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Approved Products and Manufacturers.
      a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.

B. Description:
   1. Ferrous Metal:
      a. New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
   2. Galvanized Metal:
      a. New Surfaces: Use MPI(a) INT 5.3J Latex Finish system
   3. Aluminum:
      a. New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.

C. Performance:
   1. Design Requirements:
      a. New Surfaces: MPI Premium Grade finish requirements.
      b. Gloss / Sheen Level Required: Gloss Level 5.

   2. Color Quality Standard:
      a. Sherwin Williams.
      b. Dunn Edwards

D. Materials:

1. Primers:
   a. Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
   b. Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based'.
   c. Aluminum: MPI Product 95: 'Primer, Quick Dry, for Aluminum'.
2. Finish Coats: MPI Product 153: 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

A. General:
   1. See appropriate paragraphs of Section 09 9001.
   2. Systems specified are in addition to prime coats furnished under other Sections.

B. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.

END OF SECTION

SECTION 09 9413

INTERIOR TEXTURED FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and apply texturing on walls and ceilings.

B. Related Requirements:
   1. Section 09 2900: 'Gypsum Board' for priming.
   2. Section 09 9001: 'Common Painting And Coating Requirements' for:
   3. Section 09 9123: 'Interior Painted Gypsum Board, Plaster' for finish painting.

1.2 REFERENCES

A. Definitions:
   1. Drywall Texture: Compound rolled, sprayed, or troweled onto sheetrock after taping and floating of joints is complete. Uses same material as joint compound, but thinned down with water and applied to wall surface:
      a. Smooth - Smooth application of texture over sheetrock wall that feathers out sheetrock joints, and creates even, non-textured wall.

1.3 QUALITY ASSURANCE

A. Field Samples:
   1. Before performing work of this Section, prepare control samples.
   2. Architect will inspect control sample at pre-installation conference following preparation of control sample. When sample is approved, work of this Section may proceed. Approved samples will be kept at site at all times work of this section is being performed.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Manufacturer Contact List:
      a. National Gypsum, Charlotte, NC www.nationalgypsum.com.
      b. U S Gypsum Co, Chicago, IL www.usg.com.

B. Materials:
   1. Quality Standards: See Section 01 6200.
      a. ProForm Perfect Spray EM/HF by National Gypsum.
      b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

PART 3 - EXECUTION

3.1 APPLICATION

A. Location:
   1. Walls:
      a. Smooth Texture:
         1) All areas
   2. Ceilings:
      a. Smooth Finish (no applied texture) to be applied to the ceilings:

B. Finishing:
   1. Smooth:
      a. No applied texture is required. Apply priming and paint as specified in Section 09 9123.

END OF SECTION

SECTION 09 9623

POLYURETHANE COATING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Preparing and coating stone veneer.

B. Related Requirements:
   1. Section 09 9001: 'Common Painting And Coating Requirements':
      a. Pre-installation conference for Sections under 09 9000 heading ‘Paints and Coatings’.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Approved Products and Manufacturers.

B. Description:
   1. Polyurethane HD Isofree Aliphatic 2K floor coating Satin.

C. Manufacturer
   1. Exterior Performance Coatings, Inc.
   2. Phone - 630 675 4509.
   3. sales@exteriorcoatings.com

PART 3 - EXECUTION

3.1 APPLICATION

A. General: See appropriate paragraphs of Section 09 9001.

B. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and any other contaminants

C. Apply in accordance with manufacturers current printed instructions

END OF SECTION

SECTION 10 1400
BUILDING LETTERS AND NUMERALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Sign identification color scheme per San Bernardino County Maintenance and Operations standards,

1.2 SUMMARY

A. This Section includes the following:

1. Cast aluminum building letters and numerals.
2. Coordination of the building letters and overall sign package approval by General Contractor.

B. Room Signage – Section 10 1423.

1.3 SUBMITTALS

A. Shop Drawings: Provide shop drawing for letters, logo and plaque, full scale, showing all its features and layout of copy. Provide template for layout of building letters and numerals. The numbers and letters shall be designed as back lit illuminated “California Halo” style.

B. Permit for building numbers shall be included with overall Signage vendor permit if required to be reviewed as part of signage with back lit option. General contractor to include the building letters.

PART 2 - PRODUCTS

2.1 BUILDING LETTERS AND NUMERALS: Cast of aluminum. Casting shall be free of pits and gas holes. Shall be back lit illuminated “California Halo” style.

A. Address Numerals: Satin aluminum finish with protective lacquer.
1. Font: Arial
2 Height: 18”.
3. Text: As shown on building elevations.

. Letters: Same as numerals.
1. Font: Arial
2. Height: 18”
3. Text: As shown.

3. MOUNTING: Threaded rods adhesively set into holes in masonry walls or toggle bolts into metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with the Installer present, for compliance with requirements and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install letters and numerals plumb and level, in locations and with mounting specified. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

3.3 CLEANING AND PROTECTING

A. At completion of installation, clean surfaces according to manufacturer's written instructions.

B. Protect letters from damage until acceptance by Owner at the time of Substantial Completion.

END OF SECTION

SECTION 101423
ROOM SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. ADA-compliant room-identification signs, interior.
2. All rooms within the building shall have identification signs posted

B. Building letters – Section 10 1400.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign.
4. Room-Identification Signs: Full-size Sample.

C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

PART 2 - PRODUCTS

2.1 ROOM SIGNS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. All Sign Systems
2. Muntain States Specialties
3. Effective Signs
4. Signsource

2.2 ROOM SIGNS

A. Zinc Alloy: 1/8” thickness zinc, alloy and temper recommended by metal producer for interior use.

B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

C. Colors: Selected by Architect and in accordance with local and Federal Standards.

D. Finish and Contrast: Matte finish, with characters contrasting with background by at least 20%.

E. Letters and Braille Characters:
   1. Raised 1/32” upper case, san serif or simple serif, accompanied with Grade 2 Braille. Raised characters at least 5/8” high.
   2. Letters and Numbers: Width-to-height ratio from 3:5 to 1:1, stroke width to height ratio from 1:5 to 1:10.
   3. Text: See Door Schedule and sign details.
   4. Mounting: Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.3 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.

   1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

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

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Room-Identification Signs: Install in locations on walls as indicated and according to accessibility standard.

C. Mounting Methods:

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position and push to engage tape adhesive.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 1453

TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnishing and installing of exterior post-mounted site signage as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3053: 'Miscellaneous Exterior Cast-In-Place Concrete' for quality requirements of concrete used for parking sign posts.

1.2 REFERENCES

A. Reference Standards:
   1. International Code Council / American National Standards Institute:
      a. ICC/ANSI A117.1-2010, ‘Accessible and Usable Buildings and Facilities'.
   2. U.S. Department of Justice:
      a. 2010 'ADA Standards for Accessible Design'.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Sign shall meet ANSI A117.1 accessibility code and ADA standards for accessible design and local and state authorities having jurisdiction (AHJ) requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Permanently Mounted:
   1. Post Foundation Concrete: One cu ft cement, 2 cu ft (0.0566 cu m) sand, 4 cu ft (0.1132 cu m) gravel, and 5 gallons (18.93 liters) minimum to 6 gallons (22.71 liters) maximum of water.
   2. Post Setting Grout at Sleeves:
      a. Acceptable Products:
         1) Normal Construction Grout A by Bonsal American, Charlotte, NC www.bonsal.com.
         2) Advantage 1107 Grout by Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
         3) NS Grout by Euclid Chemical Co, Cleveland, OH www.euclidchemical.com
         4) 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
         5) Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com
         6) Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
         7) Tamms Grout 621 by TAMMS Industries, Mentor, OH www.tamms.com.
         8) U S Spec MP Grout by U S Mix Products Co www.usspec.com.
         9) CG-86 Grout by W R Meadows, Hampshire, IL www.wrmeadows.com.

10) Equal as approved by Architect before use. See Section 01 6200.

3. Accessible Parking Signs:
   a. Design Criteria:
      1) Meet regulatory agency requirements for accessibility.
      2) Sign graphics and lettering shall be minimum required by agency having jurisdiction:
         a) International symbol of accessibility should be posted on all accessible parking spaces and all accessible parking lot entrances.
         b) Letters must contain visual characters and high dark to light contrast between characters and background as per ADA requirements:
         c) Provide reflective background.
         d) Van-accessible parking spaces to have additional 'text' or 'sign' below the accessibility symbol to mark the van-accessible area specifically:
      3) Size: 12 inches (305 mm) x 18 inches (457 mm) aluminum sign.
      4) Sign shall have rounded corners.
   b. Acceptable Products:
      1) Parking signs by My Parking Sign, Brooklyn, NY www.MyParkingSign.com.
      2) Equal as approved by Architect before use. See Section 01 6200.
4. Posts:
   a. Handicap Accessible Parking Signage:
      1) Provide galvanized post as shown on Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Permanently Mounted:
   1. Locate as shown on Site Plan.
      a. Follow ADA guidelines and local and state authorities having jurisdiction (AHJ) for placement of sign requirements:
         1) Van accessible sign should be placed so that it is not obscured by anything including a standing van, vehicle or other obtrusive objects.
         2) Signs should be placed at such a height (at least 60 inches (1 500 mm) above surface) that they do not get obscured by any parked vehicles or other obstructions. Signs must be viewable from drivers' seat of vehicle and located right in view of parking spaces.
   2. Install signs square and plumb.
   3. Post Foundations:
      a. Follow requirements of Section 03 3053: 'Miscellaneous Exterior Cast-In-Place Concrete' for post foundation:
         1) Mix concrete components thoroughly, place in post foundation holes sized as shown on Contract Drawings.
      b. Mow Strips:
         1) At mow strips where shown on Site Plan, set top of post foundation below grade sufficient to allow for placing of mow strip.
      c. Placement Before Installation of Slabs:
         1) Measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post.
      d. Placement After Installation of Slabs:
         1) Where posts are installed after installation of slabs, core slab width of foundation diameter as shown on Contract Documents to accommodate post foundation.
   4. Handicap Accessible Parking Signage:
      1) Attach sign to galvanized steel posts as shown on Contract Drawings with stainless steel self tapping screws.
      2) Isolate dissimilar materials (steel tube and aluminum sign).
   5. Post Foundations:

a. Mix concrete components thoroughly, place in post foundation holes 8 inches (200 mm) in diameter by 36 inches (900 mm) deep, and set mounting sleeves. Sleeves shall extend 2 inches (50 mm) maximum above top of finish concrete elevation.
   1) Where posts are installed before installation of slabs, measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post.
   2) Where posts are installed after installation of slabs, core slab 8 inches (200 mm) in diameter minimum to accommodate post foundation.

b. Install post in mounting sleeve so bottom of post is 6 inches (150 mm) from top of sleeve. Rivet post to mounting sleeve or bolt using tamper-proof bolts.

END OF SECTION

SECTION 10 1490

MISCELLANEOUS INTERIOR CODE SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Products Supplied But Not Installed Under This Section
   1. Code Signs

B. Related Sections
   1. Division 06 2001: Installation

1.2 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Schedule showing signs required, location, and text.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Restroom Accessibility Signs
   1. Men's – equilateral triangle 1/4" thick, 12" long edges with base parallel to floor and vertex pointing upward. ANSI A117.1 symbol for men.
   2. Women's – circle 1/4" thick, 12" in diameter. ANSI A117.1 symbol for women.
   3. Unisex – circle 1/4" thick, 12" in diameter. ANSI A117.1 symbol for unisex facilities.
   4. Mount in center of door at 60" above floor to symbol center.
   5. Blue background with white symbol, engraved.

B. Handicap Symbol of Accessibility
   1. Mount on building exterior adjacent to accessible entrance; mount 40" above floor.
   2. Mount adjacent to accessible restrooms.
   3. White symbol on blue background.

C. Tactile Exit Signs
   1. Provide tactile exit signs as shown on drawings in compliance with CBC Section 1117B.5

D. Identification Signs Required By Fire Department
   1. Provide signs identifying fire roof access and electrical room in accordance with Fire Department requirements.
   2. Provide signs identifying fire extinguishers in accordance with Fire Department Requirements.

E. Approved Manufacturers
   1. Inland Pacific – Spokane, WA (800) 541-4000
   2. CCSW Graphics – Corpus Christi, TX (800) 322-4515
   3. Mark Master – Tampa, FL (800) 441-6275
   4. South Texas Graphics Specialties, Inc. – Houston, TX (713) 467-4499
   5. AA White Company – Providence RI (401) 453-4300

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install signs square and plumb.

B. Mount with permanent two-sided tape.

END OF SECTION

SECTION 10 2114
PHENOLIC CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Phenolic core compartment partitions for following applications:

a. Toilet enclosures.
b. Privacy screens.
c. Urinal screens.

B. Related Requirements:

Division 03 Section "Cast in Place Concrete" for compartment anchorage to concrete substrates.
Division 05 Section "Metal Fabrications" for miscellaneous structural and support metal components required to secure compartments.
Division 06 Section "Rough Carpentry" for compartment anchorage to frame walls.

1.2 REFERENCES

A. ASTM International (ASTM):

ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council (ICC)/American National Standards Institute (ANSI):

ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.

C. United States Department of Justice:

ADA - Americans with Disabilities Act, Excerpt from 28 CFR Part 36 - ADA Standards for Accessible Design.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.

Product Test Reports: When requested by Architect, submit documentation by qualified independent testing agency indicating compliance of products with requirements.

B. Shop Drawings: Include overall product dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.

C. Samples for Selection: Furnish samples of selected colors for approval.

D. Samples for Verification: Furnish physical sample of material in selected color.

Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance and cleaning instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments.

B. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments. Manufacturers seeking approval must submit the following in accordance with Instructions to Bidders and Division 01 requirements:

Product data, including test data from qualified independent testing agency indicating compliance with requirements.
Samples of each component of product specified.
List of successful installations of similar products available for evaluation by Architect.

C. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.

D. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.

E. Accessibility Requirements: Comply with requirements of ICC/ANSI 117.1, and with requirements of authorities having jurisdiction.

F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Flame-Spread Index: 30.
Smoke-Developed Index: 110.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.

Deliver toilet compartments in manufacturer's original packaging.
Store in an upright condition.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:

Phenolic Core Toilet Partitions: Against delamination: 3 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of **Bradley Corporation, Mills Metals Division, Menomonee Falls, WI 53051**.

Contact Information: (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com; Website www.bradleycorp.com.

Equal as Approved by Architect prior to bidding.

2.2 MATERIALS

A. Phenolic Core: Compressed cellulose impregnated with phenolic resins. Provide smooth material, without creases or ripples.

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. Stainless Steel Sheet: ASTM A 240 or A 666, 300 series.

D. Stainless Steel Castings: ASTM A 743/A 743M.

E. Aluminum: ASTM B 221.

2.3 PHENOLIC CORE TOILET COMPARTMENTS

A. Toilet Compartment Type:

Overhead braced.

a. Basis of Design Product: **Bradley, Mills Partitions, Sentinel, Series 400**.

Wall hung with brackets:

b. Basis of Design Product: **Bradley, Mills Partitions, Model No. 4**.

B. Door, Panel, and Pilaster Construction, General: Form edges with 15 degree bevel without crown molding. Finish edges smooth.

Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections.
Core Material: Manufacturer's standard solid resin core of thickness required to provide finished thickness for doors, panels and pilasters.

C. Door Construction: 3/4 inch (19 mm) thick.

D. Panel Construction: 1/2 inch (13 mm) thick.

E. Pilaster Construction: 3/4 inch (19 mm) thick.

Provide pilaster with mechanically fastened leveling bar reinforcement with zinc-plated jack bolt for leveling.

F. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Provide clamps for attachment to pilaster and stainless steel brackets to secure to wall.

G. Shoes: 4 inches (102 mm) high minimum, Type 304 stainless steel with No. 4 satin brushed finish. Provide concealed retainer clips to attach to pilaster.

H. Urinal-Screen Construction: Matching toilet compartment panel construction

I. Brackets (Fittings):

Stirrup Type: Ear or U-brackets; [stainless steel].
Full-Height (Continuous) Type: Manufacturer's standard design; [stainless steel].

J. Phenolic Core Finish: Manufacturer's standard impregnated, with [one color] in each room.

Plastic Laminate Color: As selected by owner.

2.4 HARDWARE

A. Hardware, Heavy Duty: Manufacturer's heavy-duty stainless steel castings, including stainless steel tamper-resistant fasteners:

Hinges: Self-closing surface mounted, through bolted, with gravity cams, adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door. Mount with stainless steel through-bolts.
Latch and Keeper: Surface-mounted slide latch with flat rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.
Coat Hook: Combination hook and rubber-tipped stop, sized to prevent door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide

formed L-shaped hook without stop at outswing doors. Mount with stainless steel through-bolts.

Door Pull: Standard unit on outside of inswing doors. Provide pulls on both sides of outswing doors.

2.5 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 26-inch- (660-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.

Proceed with installation once conditions meet manufacturer's requirements.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.

C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.

D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than [three brackets attached at midpoint and] near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

3.4 FINAL CLEANING

A. Remove packaging and construction debris and legally dispose of off-site.

B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10 2114.15
PLASTIC LAMINATE TOILET PARTITIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The toilet partitions shall be plastic laminate with floor anchored/overhead braced mounting style as manufactured by ASI Accurate Partitions, Burr Ridge, Illinois.

B. Furnish all labor and materials necessary for completion of work in this section as shown in the approved drawings and specified herein.

1.2 RELATED WORK

A. Specified elsewhere shall include accessories and anchorage/blocking for attachment of partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of
ASI Accurate Partitions, 160 Tower Drive, Burr Ridge, IL 60527
Contact Information: (708) 442-6800, fax (708) 442-7439.
Website www.asi-accuratepartitions.com
Equal as Approved by Architect prior to bidding.

2.2 DOORS, PANELS AND URINAL SCREENS

A. Shall have a finished thickness of 1” with decorative plastic laminate is applied to 7/8” thick particleboard. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

2.3 PILASTERS

A. Shall have a finished thickness of 1-1/4”, with decorative plastic laminate applied to 1-1/8” thick particleboard

2.4 MATERIAL

A. Doors, panels, pilasters and urinal screens shall be fabricated from 45-pound density, resin impregnated 7/8” thick particle board. Decorative plastic laminate shall be applied to the particleboard with a non-toxic, water resistant adhesive under high pressure. All components shall be edge banded prior to face lamination to ensure moisture run-off and vandal resistance.

2.5 FINISH

A. All components shall have faces and edges covered with a decorative, vertical grade (.50 thickness) laminate.

2.6 COLOR

A. Shall be selected from Accurate' s full range of standard designer colors.

2.7 DOOR HARDWARE

A. Shall be Accurate gravity cam-action hinge that permits door to return to a pre-set position when not locked. Hinge, strike and keeper shall be chrome plated Zamac to resist corrosion and through bolted with tamper resistant barrel nuts and shoulder screws. Cam-action hinge shall allow emergency access by lifting the door from the bottom.

2.8 MOUNTING HARDWARE

A. Chrome plated Zamac stirrup brackets shall be secured to walls and pilasters with stainless steel tamper resistant fasteners. Panels shall be through bolted with tamper resistant barrel nuts and shoulder screws.

2.9 CONSTRUCTION DESIGN

A. Partitions shall be anchored to the floor by a 1-piece, 3" high, stainless steel anchor trim with bottom plate through which concrete anchors are driven into the floor. Pilaster is leveled with machine screw threaded into an insert in bottom of pilaster and is fastened to anchor trim with tamper resistant stainless fasteners. Aluminum headrail with anti-grip profile shall provide overhead bracing and span all partitions and brace the end pilaster to the back wall.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Shall be installed in accordance to the Accurate installation instructions with compartments rigid, straight and plumb. Doors and panels shall be mounted 12" above the finished floor.

3.2 WARRANTY

A. ASI Accurate Partitions guarantees its plastic laminate partitions, properly maintained, against discoloration or delamination for 5 YEARS from the date of receipt by the customer. If material is found defective during that period, the material shall be replaced free of charge. No credits or allowances shall be issued for any labor or expenses relating to the replacement of components covered under the warranty plan.

END OF SECTION

SECTION 10 2113.13

METAL TOILET PARTITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal toilet compartments.

1.2 REFERENCE STANDARDS

A. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings 2022.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.4 SUBMITTALS

A. Product Data: Provide data on panel construction, hardware, accessories, and color selection.

B. Manufacturer's Installation Instructions: Indicate special procedures.

C. Closeout Submittals:
   1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final executed copy of Warranty.
      b. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's literature or cut sheet.
            b) Color selection.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage and Handling Requirements:
   1. Store and handle in compliance with Manufacturer’s instructions and recommendations

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal Toilet Compartments:
   1. Accurate Partitions Inc, Lyons, IL www.accuratepartitions.com.
   2. AMPCO Products Inc, Miami, FL www.ampco.com.

3. Columbia Partitions, Columbia, SC www.psisc.com.
4. Flush-Metal Partition Corp, Maspeth, NY www.flushmetal.com.
5. Global Steel Products Corp, Eastanollee, GA www.globalpartitions.com.
6. Hadrian Inc, Mentor, OH www.hadrian-inc.com.
7. Knickerbocker Partitions Corp, Freeport, NY www.knickerbockerpartition.com.
8. Metpar, Westbury, NY www.metpar.com.

2.2 COMPONENTS

A. Toilet and Miscellaneous Partitions:
1. Floor-mounted, overhead-braced.
2. Panels:
   a. Galvanized bonderized steel sheets (minimum 0.00015 inch (0.004 mm) zinc coating).
   b. Edges bound interlocked with drawn molding welded on corners.
   c. Corners welded and ground smooth.
   d. Sound deadening honeycomb core.
   e. Provide wood blocking on all panels that have grab bars.
   f. Gauge:
      1) Doors: 22 ga (0.08 mm) minimum.
      2) Panels: 22 ga (0.08 mm) minimum.
      3) Pilasters: 22 ga (0.08 mm) minimum.
      4) Screens: 22 ga (0.08 mm) minimum.
3. Posts:
   a. 20 ga (one mm) minimum of same construction and finish as panels.
4. Headrails:
   a. Aluminum.
   b. 20 ga (one mm) minimum of same construction and finish as panels.
   c. Anti-grip design.
5. Plinths:
   a. 20 ga (one mm) Type 304 stainless steel, Number 4 finish.
   b. 3 inch (76 mm) minimum high, secured with concealed clips.
   c. All fasteners used to attach Plinths, Posts and Pilasters to the floor shall be Type 304 stainless steel.
6. Anchorages and fasteners:
   a. Concealed: Non-corrosive, protective finish.
   b. Tamper resistant Torx Head with pin screws.
7. Hardware:
   a. Each door:
      1) Gravity type hinges with double handed, nylon bottom cam, adjustable for partial door closing position, bottom hinge finished flush with door bottom.
      2) Sliding or concealed door bolt with emergency access.
      3) Door strike and keeper with rubber bumper.
      4) Coat hook / door bumper.
   b. Finish: Chrome plated.
   c. Meet requirements of ASTM B86, Alloy AG 40A.
8. Urinal Partition:
   a. Basic construction same as panels above, floor and ceiling mounted.
   b. Width to be 16 inches (400 mm) minimum.
      1) Partition maximum width shall not encroach into required accessibility clear floor space.

2.3 FINISHING

A. Finish and Color:
1. Powder-coated paint finish.
2. Color Quality Standards. See Section 01 6000. (Select color to coordinate with floor and wall tile selection.)
   a. Accurate:
      1) 836 Sand

2) 917 Adobe
3) 920 Almond
4) 965 Antique White
5) 985 White
6) 990 Light Gray

b. Ampco:
1) White
2) Yoke White
3) Concrete
4) Folkstone
5) Porcelain

c. Global:
1) Almond 2103
2) Khaki 2115
3) White 2129

d. Flush-Metal:
1) 21 Dove Grey
2) 25 Oyster White
3) 35 Beige
4) 61 White
5) 70 Vanilla

e. Hadrian:
1) Almond 603 or Latte 532
2) White 500
3) Linen 504
4) Extra White 541

f. Knickerbocker:
1) Almond 1111 or Sand 5123
2) White

g. Metpar:
1) Almond 300
2) White 149
3) Platinum 715

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that field measurements are as indicated.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

E. Field verify dimensions.

F. Verify that necessary blocking has been installed in framed walls for partition installation and for place where coat hook / door bumper will strike wall.

3.2 INSTALLATION

A. Install pilasters rigid, plumb, and level. Maintain proper door openings. Anchor pilaster to floor with Type 304 stainless steel fasteners embedded 2 inches (50 mm) into concrete slab below setting bed.

B. Secure panels to walls with two stirrup brackets minimum attached near top and bottom of each panel. Use fasteners of length to provide one-inch (25 mm) embedment into blocking or masonry.

C. Secure overhead brace to face sheets with two fasteners minimum per face. Set door tops parallel with brace. Set door bottom 12 inches (300 mm) above floor.

D. Plinth to be level with and snug to floor.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
   2. Replace damaged or severely scratched materials with new materials at no additional cost to the Owner.

3.5 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

3.6 CLEANING

A. Remove protective masking. Clean exposed surfaces of partitions, hardware, fittings, and accessories.

B. Touch-up minor scratches and other finish imperfections using materials and methods recommended by Manufacturer.

END OF SECTION

SECTION 10 2813

COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Selected accessories for Rest Rooms:
      a. Sanitary Napkin Disposal Container.
      b. Toilet Tissue Dispenser
      c. Mirrors.
      d. Grab Bars.
      e. Napkin Disposal
      f. Soap Dispenser
      g. Seat Cover Dispenser
      h. Towel Dispenser / Waste Receptacle
   2. Custodial Room accessories:
      a. Utility Shelf.

B. Related Requirements:
   1. Section 09 2216: Blocking for metal framing
   2. Section 06 2001: Installation.

1.2 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Schedule showing items used, location where installed, and proper attaching devices for substrate.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Final, executed copy of Warranty.
      b. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's literature or cut sheets.

1.3 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's standard warranty against rusting.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers:
   1. Manufacturer List:
      a. A & J Washroom Accessories, New Windsor, NY www.ajwashroom.com.

b. American Accessories Inc (AAI), Denison, TX www.aaiusaonline.com.
c. American Specialties Inc (ASI), Yonkers, NY www.americanspecialties.com.
d. Bobrick Washroom Equipment Inc, North Hollywood, CA www.bobrick.com or Bobrick Washroom Equipment of Canada Ltd, Scarborough, ON (416) 298-1611.
e. Bradley Corp, Menomonee Falls, WI www.bradleycorp.com.
f. General Accessory Manufacturing Co (GAMCO), Durant, OK www.gamcousa.com.

B. Materials:
1. Approved Products. See Section 01 6200.
a. Rest Rooms:
1) Sanitary Napkin Disposal Container:
a) Bradley, model 4722-15, surface mounted, satin finish as design standards
b) Equal as approved prior to bidding
2) Soap Dispenser:
a) Bradley, model 6326, lavatory-mounted, stainless steel finish as design standards
b) Equal as approved prior to bidding
3) Mirrors: Frameless Glass with clip fasteners
a) Bradley, model 747-3636, 36” x36”, design standards
b) Equal as approved prior to bidding
4) Grab Bars:
a) Concealed mount, 18 ga (1.27 mm), type 304 stainless steel, 1-1/2 inch (38 mm) diameter, and peened (non-slip) finish in configuration shown on Drawings. Bradley design standards.
b) Equal as approved prior to bidding
5) Utility Shelf:
a) Janitor Closet: Bradley, model 9934-5, stainless steel, satin finish, five hooks and four holders
b) Equal as approved prior to bidding
6) Toilet Tissue Dispenser
a) Bradley, model 5402, dual roll, stainless steel as design standards
b) Equal as approved prior to bidding
7) Seat Cover Dispenser:
a) Bradley, model 5831, surface-mounted, 250 capacity, stainless steel, satin finish as design standards
b) Equal as approved prior to bidding
8) Towel Dispenser / Waste Receptical Combination
a) Bradley, model 2252-10, semi-recessed, high capacity towel dispenser and 4.9 gallon waste receptacle, stainless steel, satin finish as design standard
b) Equal as approved prior to bidding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install using mounting devices proper for base structure.

B. Where possible, mount like items in adjoining compartments back-to-back on same partition.

END OF SECTION

SECTION 10 2814

BABY-CHANGING STATION

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Provide one Baby-changing station in each public restroom.

B. Related Requirements:
   1. Section 09 2216: 'Non-Structural Metal Framing' for blocking in metal-framed walls.
   2. Section 06 2001: Installation.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the efforts of the various trades affected by the Work of this Section.
   2. Coordinate completions of blocking in walls.

B. Sequencing:
   1. Install baby-changing stations after the following as been completed:
      a. Adjacent walls and ceilings are finished and painted.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Manufacturer Instructions:
      a. Printed installation instructions.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Bonds:
         1) $10,000,000 minimum product liability insurance policy.
      b. Warranty Documentation:
         1) Include copy of final, executed warranty.
      c. Record Documentation:
         1) Manufacturers Documentation:
            a) Manufacturer's literature or cut sheets.

1.4 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's standard 5-year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Approved Manufacturers. See Section 01 6200.

1. Koala, Denver, CO www.koalabear.com.

B. Baby Changing Station:
   1. Molded high impact polyethylene with integral straps for securing baby.
   2. Surface mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Verify that solid blocking has been installed where changing station is to be installed.
   2. Do not install unit by any other means other than screws or lag bolts into solid blocking.

3.2 INSTALLATION

A. Install items in accordance with Manufacturer's submitted, written instructions for screws or lag bolts into solid substrate. Install using mounting devices proper for base structure.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Wall hung extinguishers and brackets.
   2. Extinguishers with cabinets.

B. Related Requirements:
   1. Section 06 1100: 'Wood Framing' for blocking in wood-framed walls.
   2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
   3. Section 09 2216: 'Non-Structural Metal Framing' for blocking in metal-framed walls.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's literature or cut sheets for cabinets and extinguishers.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Warranty Documentation:
         1) Include copy of final, executed warranty.
      b. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

1.4 WARRANTY

A. Manufacturer Warranty:
   1. Manufacturer's standard, written warranty on fire extinguisher.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Manufacturers:
   1. Fire Extinguishers:
      a. Approved Manufacturers. See Section 01 6200.
         1) Amerex Corp, Trussville, AL www.amerex-fire.com.

2) Ansul Incorporated, Marinette, WI www.ansul.com.

3) Buckeye Fire Equipment, Kings Mountain, NC www.buckeyef.com.
4) Extinguishers private-labeled by manufacturers approved above are approved, with appropriate documentation.

2. Cabinets And Brackets:
   a. Acceptable Manufacturers:
      1) J L Industries, Bloomington, MN www.jlindustries.com.
      2) Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
      3) Modern Metal Products / Technico, Owatonna, MN www.modern-metal.com.
      4) National Fire Equipment Ltd, Scarborough, ON www.nationalfire.com.
      5) Potter-Roemer, Cerritos, CA www.potterroemer.com.
      6) Samson Products Inc, City of Commerce, CA www.samsonproducts.com.
      7) Seton Inc, Richmond Hill, ON (905) 764-1122.
      8) Equal as approved by Architect before bidding. See Section 01 6200.

B. Acceptable Distributors:
   1. W.W. Grainger, Inc., Lake Forest, IL www.grainger.com.
   2. Equal as approved by Architect before bidding. See Section 01 6200.

C. Fire Extinguishers:
   1. Design Criteria:
      a. Ten pound dry chemical ABC stored pressurized type equipped with pressure gauge and which does not need recharging except after use.
      b. Instructions for repairs, maintenance, and recharging shall be attached.
      c. Unit shall be tested and approved by UL and have minimum 4A:60-B:C UL rating. UL rating shall appear on extinguisher labels and be attached to and a part of fire extinguisher units.

D. Fire Extinguisher Cabinets:
   1. Design Criteria:
      a. Two-piece, semi-recessed or flush type depending on wall thickness, and have white baked enameled steel tubs with white baked enamel return trim and doors, clear acrylic glazing, 'Safe-T-Lock,' and cylinder locks.
      b. Supply each cabinet with one specified fire extinguisher.
   2. Acceptable Manufacturers:
      a. Basis of Design Product: Ambassador 1017 G10 by J L Industries.
      b. Equal as approved by Architect before bidding from Acceptable Manufacturer's equivalent product. See Section 01 6200.

E. Wall-Mounted Brackets:
   1. Design Criteria:
      a. Heavy duty with minimum of double strap/bracket.
   2. Approved Bracket. See Section 01 6200:
      a. Basis of Design Product: No. 846 by Larsen's.
      b. Equal as approved by Architect before bidding from Approved Manufacturer's equivalent product.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Special Techniques:
   1. Securely mount cabinets and hangers plumb with wall surfaces.
   2. Trim for cabinets shall be neat in appearance.

END OF SECTION

SECTION 116000

ANIMAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS DESCRIPTION OF WORK

A. Types of equipment required include the following:
1. Dog Kenneling (AE-1)
2. Dog Kennel Guillotine Doors (AE-2)
3. Insulated Pet Door (AE-3)
4. Cat Cages (AE-4)
5. Dog Medical Holding Cages (AE-5)
6. Cat Medical Holding Cages (AE-6)
7. Intake Holding Cages (AE-7)
8. Grooming Tub (AE-8)
   a. AE-8A - Left Hand Drain
   b. AE-8B - Right Hand Drain
9. Grooming Table (AE-9)
10. Other Animal Cages (AE-10)
    a. AE-10A - 24” X 30” Cages
    b. AE-10B - 36” X 30” Cages
11. Animal Kitchen Dishwasher - Large (AE-11)
12. Exam Table (AE-12)
13. Surgery Table (AE-13)
14. Surgery Light (AE-14)
15. Exam Treatment Table (AE-15)
16. Tub Table (AE-16)
    a. AE-16A - Left Hand Tub Table
    b. AE-16B - Right Hand Tub Table
17. Countertop Autoclave (AE-17)
18. Wet Dental/Treatment Lift Table (AE-18)
19. Narcotics Safe (AE-19)
20. Scales (AE-20)
21. ICU Cages (AE-21)
    a. AE-21A - 24” X 30” Cages
    b. AE-21B - 5’-0” Cage Configuration
22. Cat Pet Door (AE-22)
23. Catio Enclosure Panels (AE-23)
24. Anesthesia Machine (AE-24)
25. Automatic Dog Waterer (AE-25)
26. Pressure Wash System (AE-26)

B. Basis of Design: The Contractor’s bid shall be based on the manufacturer and model identified as the Basis of Design. Other manufacturers and models may be considered as equal if approved by the Architect as a substitute. Refer to other sections of Project Manual for requirements.

C. The General Contractor is advised that the products in this section cannot be obtained from one single vendor, and they will have to solicit bids for the various separate manufacturers listed.

D. The General Contractor shall provide on his Bid Form the cost he has included in his bid for the Animal Equipment. The cost shall be provided as follows: First, the total amount of all Animal Equipment broken down as Material, Installation and total. Then, broken down by the 25 categories noted above, Material, Installation and total.

1.3 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

1.4 QUALITY ASSURANCE

A. Qualifications: Engage manufacturing firms specializing in the manufacturing and installation of animal equipment. Manufacturer must have a minimum of five (5) years of production and installation experience of similar works and requirements of this Section. Installation must be done by factory-trained and approved personnel for the specific item they are installing.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for all equipment. Submit operating and maintenance instructions.

B. Shop Drawings: Prepare Floor Plans, Elevations, sections and details as necessary to convey the proper understanding of the scope of the work for each item.

1.6 DELIVERY AND STORAGE

A. Deliver products to project site in manufacturer's undamaged protective containers. Deliver products for interior spaces after spaces to receive them have been fully enclosed.

1.7 SPECIFIED PRODUCT WARRANTY

A. Submit manufacturer's standard written warranty. The length of warranty varies per product, but in no case less than 1 year.

PART 2 - PRODUCTS

2.1 DOG KENNELING (EQUIPMENT ITEM #AE-1)

A. Dog Kenneling
1. Manufacturer
   a. Midmark (formerly Mason Company, (800) 543-5567 (Basis of Design)
   b. Shoreline, 888-551-4062
   c. Direct Animal Products. 940-433-5468
   d. LGL Animal Products, Inc. 979-690-3434
2. Materials
   a. Stainless Steel
3. Kennel Fronts and Gates
   a. Kennel Front: Height 6’-8” wide per width of kennel.
   b. Kennel Gate: Height 6’-6” min and width varies but 2’-0” minimum.
   c. Swing Gates:
      1) Perimeter frame and internal bracing shall consist of 1” x 16 gauge (.060” wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded. Wire grids shall be constructed of 304 stainless steel wire 1/8” in diameter in the vertical direction with 1 5/8” spacing between wires, and 304 stainless steel wire 1/4” in diameter in the horizontal direction with 6” or less spacing between wires. Horizontal and vertical wires shall be resistance welded at each juncture. Provide weep holes in the bottom of stainless steel tubes.
      2) Gate Hinges shall consist of two 3/8” diameter stainless steel hex head screws which shall be threaded into stainless steel tapped plugs inserted into the top and bottom of the door frame. Each plug shall contain a nylon pivot bushing for smooth precision rotation.
      Patented stainless steel two-way latch shall open both outward and inward. The latch shall secure automatically when gate is closed from the outward position and from the inward position it shall be able to latch and open from the inside of kennel. It shall be designed to accept a padlock. The two-way latch bar, the latch catch, and the swing pendant shall be made from 304 stainless steel.
      3) Gate Shall be designed and installed so the gates will swing both into the run and swing out of the run.

4) At locations where dogs face each other across the aisle from each other, the lower half of the kennel front fixed panel shall be opaque stainless-steel panel.

4. Side Walls
   a. At Adoption Runs and Stray Runs runs both standard width (4'-0" wide) and large runs (wider than 4'-0") and including Puppy Pens – The General Contractor to provide side walls of Masonry Units between dogs up to 4'-6" AFF.
   The Kenneling Manufacturer to provide Flag Panels of kennel material to go on top of the General Contractor built 4'-6" high Masonry walls and extend up to 6'-8". The top of the flag panel to align with the top of the Kennel front. Kennel material shall be all stainless steel isolation panels. Perimeter frame and internal bracing shall consist of 1" x 16 gauge (.060" wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded. Wire grids shall be constructed of 304 stainless steel wire 1/8" in diameter in the vertical direction with 1 5/8" spacing between wires, and 304 stainless steel wire 1/4" in diameter in the horizontal direction with 6" or less spacing between wires. Horizontal and vertical wires shall be resistance welded at each juncture. Provide weep holes in bottom of stainless steel tube frames.
   b. At Medical Observation runs, Medical Isolation runs, Foster Dogs, and Dog Intake Holding – The General Contractor to provide masonry side walls up to 6'-8" with no vertical kennel material above. The Kenneling Manufacturer does not have to provide any flag panels at side walls on these runs.

5. Cage Tops
   a. Provide cage top covers where shown on the Animal Equipment Drawings drawing. Provide cage top covers at all Medical Observation runs, Medical Isolation runs, Foster Dogs, and Dog Intake Holding runs. These locations are noted on the Animal Equipment drawings. Stainless steel top covers shall be perimeter frame and internal bracing shall consist of 1" x 16 gauge (.065" wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded. Wire grids shall be constructed of 304 stainless steel wire 1/8" in diameter in both directions with 3" spacing between wire centerlines. All wires shall be resistance welded at each juncture. Wire grid shall be TIG welded securely to the square tubing framework. Provide weep holes in bottom of steel tube frame.

2.2 DOG KENNEL GUILLOTINE DOORS (EQUIPMENT ITEM #AE-2)

A. Transfer Doors (Guillotine)
1. Manufacturers- Mason Company (800) 543-5567 (Basis of Design)
2. Materials: Vertical sliding doors shall be one of the following materials:
   a. 1/4" thick Polymetal
   b. Channels shall be sold extruded aluminum 6063-T6. Doors are raised or lowered by pulling or releasing a 3/32" stainless steel wire cable that is secured to the top of the door. Transfer doors come equipped with cable, "S" hooks, stainless steel adjustable direction pulleys, screw-eyes, and all necessary hardware for easy installation.
3. Size:
   a. Large - For openings up to 29" high x 17" wide.
   b. Extra Large – For openings up to 34" high x 17" wide. (Located in Jumbo Runs.)
   Optional cable guards shall be made of 0.100" Aluminum sheet and shall be fastened to the channels with stainless steel screws.
4. Schedule
   a. Provide one transfer door at each indoor/outdoor set of dog kennels.

B. Dog-Bone Counterweight
1. Manufacturers – Mason Company (800) 543-5567 (Basis of Design)
2. Outer shell shall be made if high-density polyethylene. Each counterweight shall have a threaded steel insert molded into the upper end to accommodate a supplied 3/8" galvanized steel eyebolt. Shot shall be securely contained inside the outer shell to reach the desired weight.
3. Schedule
   a. Provide one dog-bone counterweight at each indoor/outdoor set of dog kennels.

C. Multi-Directional Multi-Application (MDMA) Pulley Hardware
1. Manufacturers – Mason Company (800) 543-5567 (Basis of Design)

2. Pulley Hardware shall be made of type 403 stainless steel with the pulley sheave being made from polyoxymethylene. Mounting bracket to have multiple holes for use in multiple mounting applications including installation to:
   a. Building Walls
   b. Kennel Entry Gates
   c. Division Panels
3. Pulley Frame to attach to mounting bracket using a weld stud which allows for pulley sheave to pivot 360 and placed in a set position to allow smooth cable motion. Multiple mounting holes allow for up to (2) pulleys to be attached to one bracket allowing for counter-balanced applications. Pulley sheave shall have tapered edges to keep cable centered over sheave. Pulley frame to have sheave cover when placed in an upward position to prevent cable from derailing off of pulley system.
4. Schedule
   a. Provide one multi-directional multi-application (MDMA) pulley hardware at each indoor/outdoor set of dog kennels.

2.3 SWINGING PET DOOR (EQUIPMENT ITEM #AE-3)

A. Swinging Pet Door
1. Manufacturers – BiteGaurd Kennel Plex (941) 752-7021
2. Materials
   a. Heavy Duty Aluminum Frames – Anodized aluminum frame will not warp, crack, or rust. The satin finish provides a quality appearance and allows for easy cleaning.
   b. Maximum Energy Efficiency – Doors close tightly after each use. Plush high density nylon pile weather seal ensures superior draft control.
   c. 3/8 inch Solid Acrylic Panels – Tinted see-through panels lets the light in and provides a window for dogs. Manufactured from the same materials used for jet plane windows.
   d. Chew Proof Aluminum Trim – Door panels are equipped with hardware aluminum trim to protect each panel and inhibit chewing.
   e. Security Lock and Key – The key lock feature can be used to regulate use of the kennel door and secures access when not in use.
   f. Saloon Style Door Panels – Heavy duty and built to last. The tinted see-though panels are solid 3/8-inch acrylic. Half-inch hardened aluminum trim provides extra durability and inhibits chewing.
   g. Aluminum Frames – The anodized aluminum frames will not crack, warp or rust. The satin finish provides a quality appearance and is easy to keep clean.
3. Size
   a. Kennel Doors at Standard:
      1) Model # BGSurfaceMt 1624
      2) Dog Passage 13 3/8” x 22 3/8”
      3) Rough Opening 18 3/8” x 25 5/8
   b. Kennel Doors at Jumbo runs:
      1) Model # BGSurfaceMt 1632
      2) Dog Passage 13 3/8” x 31 3/8”
      3) Rough Opening 18 3/8” x 34 5/8
4. Schedule
   a. Provide one swinging pet door at each indoor/outdoor kennel.

2.4 CAT CAGES (EQUIPMENT ITEM #AE-4)

A. Cat Cages for Adoption cats, stray cats, cat isolationism, cat medical quarantine, cat rabies quarantine, and mother cats.
1. Manufacturer: Shor-Line Company (800-444-1579)
   a. Model Number: 902.0000.52 – 48” Feline Serenity Suite w/ 30”W Main Space and 18” litter compartment, Stainless Steel
2. Materials:
   a. 22 gauge Type 304 Stainless Steel satin finish is utilized in our exclusive 2-piece unitized construction process, minimizing the number of welded seams.
   b. Front door frames are constructed of heavy-duty 20 gauge, 1” square SS tube that provides optimum strength and keeps the cage opening square at all times.
   c. Each litter box shall be equipped with a stainless-steel grille and duct extended to top of the 2 cages. The stainless-steel grille is provided by the cage manufacturer and shall be

"adjustable" to adjust the CFM at each litter box. The HVAC contractor will connect to the duct above cage.

d. Doors shall be welded stainless steel wire grid.
e. Quiet time latches are made of stainless steel and Polyethylene and helps eliminate noise and added stress for patients.
f. Patented Hinge Design is constructed of 14 gauge austenitic stainless steel that is encapsulated by an injected molded, fiberglass reinforced nylon 6/6 thermoplastic polymer.
g. Cat portals allow the pet to pass between litter and main unit. Can be left open or closed for cleaning.

3. Provide one (1) "kat kave" for each cage.
4. Size: 48" overall width (includes 18" litter space).
5. Installation
   a. These cages (2 high) will be built into the wall as a fully recessed appearance on a metal stud base 12" high, verify height with Owner. They will be framed in above the cage up to the ceiling forming a furr-down above the cages using wood or metal studs and gypsum board to create a fully recessed appearance.
   b. Provide stainless steel trim at top and bottom and each end where cages are recessed into the wall to create a trim and neat final appearance.

2.5 DOG MEDICAL HOLDING CAGES (EQUIPMENT ITEM #AE-5)

A. Manufacturer: Shor-line, 800-444-1579 (Basis of Design)

B. Model No.:
1. 902.0104.19 in:
   a. Pre-Op/Post-Op Dogs, Qty. 3 units = 12 cages

C. Features:
1. Cage constructed from Type 304 heavy-gauge stainless steel material. All seams shall be finished with precision heliarc seam welds.
2. Cages shall have fully-rounded inner corners.
3. A stainless steel front-to-rear support bar shall be included for the cages.
4. Outer door frame constructed of 3/8" diameter rod.
5. Door bars constructed with 1/4" horizontal rods and 3/16" vertical rods.
6. Hinge shall be constructed with 3/8"diameter rod.
7. Double latch shall be constructed from an 11 gauge latch bar.
8. Provide stainless steel trim strips and plates. Tight seal should be provided to all adjacent surfaces.

D. Installations:
1. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12" high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs and gypsum board to create a fully recessed appearance.
2. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

2.6 CAT MEDICAL HOLDING CAGES (EQUIPMENT ITEM #AE-6)

A. Manufacturers
1. Shor-line (Basis of Design)

B. Features:
1. Cage constructed from Type 304 heavy-gauge stainless steel material. All seams shall be finished with precision beliarc seam welds.
2. Cages shall have fully-rounded inner corners.
3. A stainless steel front-to-rear support bar shall be included for the cages.
4. Outer door frame constructed of 3/8" diameter rod.
5. Door bars constructed with 1/4" horizontal rods and 3/16" vertical rods.
6. Hinge shall be constructed with 3/8" diameter rod.
7. Double latch shall be constructed from an 11 gauge latch bar.
8. Provide stainless steel trim strips and plates. Tight seal should be provided to all adjacent surfaces.

C. Model and Size:
1. Model – 902.2430.70
2. 24" x 30"

3. Configuration – 8 cages wide and 2 cages high for a total of 16

D. Installation
1. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs and gypsum board to create a fully recessed appearance.
2. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

2.7 INTAKE CAGES (EQUIPMENT ITEM #AE-7)

A. Manufacturers
1. Shor-line (Basis of Design)

B. Features
1. Cage constructed from Type 304 heavy-gauge stainless steel material. All seams shall be finished with precision heliarc seam welds.
2. Cages shall have fully-rounded inner corners.
3. A stainless steel front-to-rear support bar shall be included for the cages.
4. Outer door frame constructed of 3/8” diameter rod.
5. Door bars constructed with 1/4" horizontal rods and 3/16” vertical rods.
6. Hinge shall be constructed with 3/8” diameter rod.
7. Double latch shall be constructed from an 11 gauge latch bar.
8. Provide stainless steel trim strips and plates. Tight seal should be provided to all adjacent surfaces.

C. Model and Size
1. Model – 902.2430.70
2. Size – 24” x 30”
3. Configuration
   a. 2 cages high
   b. 2 cages high

D. Installation
1. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs and gypsum board to reate a fully recessed appearance.
2. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

2.8 GROOMING TUB (EQUIPMENT ITEM #AE-8) TYPES A AND B

A. GROOMING TUB (EQUIPMENT ITEM #AE-8A)
1. Manufacturer: Shor-Line 800-444-1579
2. Model No. Elite Grooming Tub, No. 904.0702.41, (LH) Drain
   a. Materials – Stainless Steel
   b. Features:
      1) Dimensions: 60” H x 55.25” W x 24” D
      2) Constructed with radiused corners along all the corners of the tub.
      3) 45” angles on the front edges add an element of safety and aesthetic appeal.
      4) Featuring our innovative STAMP (STeprAMP) system that collapses steps into a ramp. The STAMP system provides two functions in one and conveniently folds away under the shower for storage while not in use.
      5) Slide in and slide out steps/ramp can be operated without bending down. No hands required.
      6) Slip resistant tread on steps/ramp.
      7) PVC Coated Tub Floors have the option of a floor panel set upon the rails to raise the showering platform to an ergonomic showering level.
      8) Door is completely removable and features the hinges that are used on our cages.
      9) Door latch is easy to use and constructed of the same long-lasting material as our hinges.
      10) Sliding restraint ring design allows dogs to be turned around in the tub without detaching the safety lead.

11) Supply Caddy can be completely removed and 2 plugs are provided to close the mounting holes.
12) Includes: Supply Caddy, 2 PVC Coated Tub Floor Panels, Hair Trap Drain Insert and Restraint Ring.

c. Wall Mount Faucet with Coil Hose
1) Model No. 804.0006.72, 8 lbs

d. Spill Resistant Vacuum Breaker
1) Modle No. 804.0015.00, 2 lbs

B. GROOMING TUB (EQUIPMENT ITEM #AE-8B)
1. Manufacturer: Shor-Line 800-444-1579
2. Model No. Elite Grooming Tub, No. 904.702.40, (RH) Drain
a. Materials – Stainless Steel
b. Features:
1) Dimensions: 60” H x 55.25” W x 24” D
2) Constructed with radiused corners along all the corners of the tub.
3) 45” angles on the front edges add an element of safety and aesthetic appeal.
4) Featuring our innovative STAMP (STeprAMP) system that collapses steps into a ramp. The STAMP system provides two functions in one and conveniently folds away under the shower for storage while not in use.
5) Slide in and slide out steps/ramp can be operated without bending down. No hands required.
6) Slip resistant tread on steps/ramp.
7) PVC Coated Tub Floors have the option of a floor panel set upon the rails to raise the showering platform to an ergonomic showering level.
8) Door is completely removable and features the hinges that are used on our cages.
9) Door latch is easy to use and constructed of the same long-lasting material as our hinges.
10) Sliding restraint ring design allows dogs to be turned around in the tub without detaching the safety lead.
11) Supply Caddy can be completely removed and 2 plugs are provided to close the mounting holes.
12) Includes: Supply Caddy, 2 PVC Coated Tub Floor Panels, Hair Trap Drain Insert and Restraint Ring.

c. Wall Mount Faucet with Coil Hose
1) Model No. 804.0006.72, 8 lbs

d. Spill Resistant Vacuum Breaker
1) Modle No. 804.0015.00, 2 lbs

2.9 GROOMING TABLE (EQUIPMENT ITEM #AE-9)

A. Manufacturer: Shor-Line Company 800-444-1579 (Basis of Design)

B. Model Number: 903.3220 Electric Lift. Color Selected by Architect

C. Features:
1. The only CSA/UL listed grooming table on the market
2. Pivoting grooming arms travels 180 degrees around the end of the table.
3. The arm locks into five positions horizontally, any position between 22” and 39” vertically. The loop hook has six position choices. All features allow the groomer to operate the table efficiently and comfortably.
4. Proprietary polyurethane coated table top provides a secure and comfortable surface for the pets. Plus, it’s durable and easy to clean.
5. You can operate our smooth and quite lifting system from both sides of the table.
6. Bright color lasts because of the powder coated, heavy-gauge steel construction.
7. The actuator lifts up to 200lbs. from 20” to 41” high.
8. Specs: Super- sized 40” L x 26” table top.

2.10 OTHER ANIMAL CAGES (EQUIPMENT ITEM #AE-10) TYPES A AND B

A. OTHER ANIMAL CAGES (EQUIPMENT ITEM #AE-10A)
1. Manufacturers

a. Shor-line (Basis of Design)

2. Features:
   a. Cage constructed from Type 304 heavy-gauge stainless steel material. All seams shall be finished with precision heliarc seam welds.
   b. Cages shall have fully-rounded inner corners.
   c. A stainless steel front-to-rear support bar shall be included for the cages.
   d. Outer door frame constructed of 3/8” diameter rod.
   e. Door bars constructed with 1/4" horizontal rods and 3/16” vertical rods.
   f. Hinge shall be constructed with 3/8” diameter rod.
   g. Double latch shall be constructed from an 11 gauge latch bar.
   h. Provide stainless steel trim strips and plates. Tight seal should be provided to all adjacent surfaces.
3. Model and Size:
   a. Model – 902.2430.70
   b. Size – 24” wide x 30” tall
   c. Configuration – 2 cages high
4. Installation
   a. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs any gypsum board to create a full recessed appearance.
   b. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

B. OTHER ANIMAL CAGES (EQUIPMENT ITEM #AE-10B)

1. Manufacturers
   a. Shor-line (Basis of Design)
2. Features:
   a. Cage constructed from Type 304 heavy-gauge stainless steel material. All seams shall be finished with precision heliarc seam welds.
   b. Cages shall have fully-rounded inner corners.
   c. A stainless steel front-to-rear support bar shall be included for the cages.
   d. Outer door frame constructed of 3/8” diameter rod.
   e. Door bars constructed with 1/4" horizontal rods and 3/16” vertical rods.
   f. Hinge shall be constructed with 3/8” diameter rod.
   g. Double latch shall be constructed from an 11 gauge latch bar.
   h. Provide stainless steel trim strips and plates. Tight seal should be provided to all adjacent surfaces.
3. Model and Size:
   a. Model – 902.3630.70
   b. Size – 36” wide x 30” tall
   c. Configuration –2 cages high
4. Installation
   a. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs any gypsum board to create a full recessed appearance.
   b. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

2.11 ANIMAL KITCHEN DISHWASHER - LARGE (EQUIPMENT ITEM #AE-11)

1. Manufacturer: Hobart (Basis of Design)
2. Model Number: CL44eN-BAS
3. Features
   a. 202 racks per hour
   b. Opti-RinSe™ system
   c. Rapid return conveyor drive mechanism
   d. Insulated hinged double doors with door interlock switches
   e. 19.5 inch chamber height opening
   f. Top mounted micro-processer control module

g. Energy saver mode
h. Dirty water indicator
i. Manager activated low temperature alert
j. NSF rated configurable Pot and Pan dwell mode
k. Configurable “intelligent” smart delime alert, determined by water hardness test at installation
l. Service diagnostics
m. NAFEM Data Protocol compliant
n. Computational fluid dynamic designed self-aligning wash manifolds
o. Stainless steel debossed anti-clogging wash arms
p. Removable integrated pump intake screen
q. Stainless steel self-draining pump and impeller
r. Single, sloping scrap screen and deep basket
s. Stainless panels enclose perimeter and bottom
t. Door actuated drain closure
u. Single point electrical connection (three phase only), does not include the booster heater
v. Convertible hot water or low temp final rinse
w. Vent fan and booster heater control
x. Stainless steel pressure-less 15/30 KW booster heater

2.12 FOLD DOWN EXAM TABLE (EQUIPMENT ITEM AE-12)

A. Manufacturer: Midmark (Basis of Design)

B. Material: Stainless Steel

C. Size: 42”L (16” folded down) x 24”W

D. Type: Wall mounted fold down

E. Installation: General Contractor to provide wood framing concealed in wall to anchor table to. Install in strict accordance with manufacturer’s requirements to ensure it is anchored securely.

2.13 SURGERY TABLE (EQUIPMENT ITEM AE-13)

A. Manufacturers: Shor-Line, 800-444-1579 (Basis of Design)

B. Model #: 903.4100.01 Classic Heated V-Top, Hydraulic Base, Rotational, 120V.

C. Features:
1. A two-panel system that adjusts from horizontal to near vertical to hold the patient in the desired position during surgery. Overall size of the top: 19” W x 58” I.
2. Two sliding, quick release, cam cleat tie-down attachments are provided on each side of the attachment rail.
3. A 3” stainless steel trough permits fluid runoff into a drain outlet.
4. Table can be lifted from 30 ½“ to 41” via hydraulic mechanism.
5. Top rotates 360 degrees.

2.14 SURGERY LIGHT (EQUIPMENT ITEM AE-14)

A. Manufacturer: Midmark (Basis of Design)

B. Model: 255 LED Procedure Light (Dual Light)
1. Model No. 255-024

C. Features:
1. Significantly more light intensity than similar products at 7,500 footcandles, an excellent color rendering index of 95 out of 100, and a color temperature of 4,400 K.
2. Counterbalanced design allows easy positioning of the light, precisely where you want it, without drifting.
3. 16 LEDs reflecting evenly off of 1,040 reflective facets will reduce the disruption of shadows while you work, producing an even distribution of light for uninterrupted illumination.
4. Turn the light on/off and adjust light intensity from controls on each side of the light head.
5. LEDs have 100 times longer life than most halogen lamps while consuming less energy, resulting in significant savings year after year.
6. Sleek contours, a sealed light head and an autoclavable handle help save maintenance time and increase product life.

D. The General Contractor shall provide and install a steel plate at the ceiling line supported by steel angles from the structure as required to support the light in accordance with Manufacturer's requirements.

E. The Electrical Contractor shall provide power to the light as required and in accordance with the Manufacturer's requirements.

2.15 EXAM AND TREATMENT TABLE (EQUIPMENT ITEM AE-15)

A. Manufacturer: Midmark (Basis of Design)

B. Model No.: DT4.C791.AN Left Hand Table (Verify)
1. 48" Long table, Frost (verify color)
2. Overall Dimension: Exam Top is 48" L x 25" W

2.16 TUB TABLE (EQUIPMENT ITEM AE-16) TYPES A AND B

A. TUB TABLE (EQUIPMENT ITEM #AE-16A)
1. TUB TABLE: Shor-Line 1-800-444-1570 or approved equal: Standard Combination Left Hand Tub/Table #904.4000.11 with the following features:
   a. 60" Long Tub/Table, white (verify color)
   b. Grill Top
   c. Provide Spray Unit with Mixing Faucet #804.0006.21.
   d. Coordinate with plumbing
2. Removable stainless-steel cover: Shore-Line Shor-Line 1-800-444-1570 or approved equal: 60" Long Exam Top #804.3004.03 with the following features:
   a. Heavy gauge, austenitic stainless steel
   b. 60" tub top measures 24 7/8" x 47 7/16"

B. TUB TABLE (EQUIPMENT ITEM #AE-16B)
1. TUB TABLE: Shor-Line 1-800-444-1570 or approved equal: Standard Combination Right Hand Tub/Table #904.4000.10 with the following features:
   a. 60" Long Tub/Table, white (verify color)
   b. Grill Top
   c. Provide Spray Unit with Mixing Faucet #804.0006.21.
   d. Coordinate with plumbing
2. Removable stainless-steel cover: Shore-Line Shor-Line 1-800-444-1570 or approved equal: 60" Long Exam Top #804.3004.03 with the following features:
   a. Heavy gauge, austenitic stainless steel
   b. 60" tub top measures 24 7/8" x 47 7/16"

2.17 COUNTERTOP AUTOCLAVE (EQUIPMENT ITEM AE-17)

A. Manufacturers: Midmark (Basis of Design)

B. Model No.: M11 (-033/ -034)
1. Physical Dimensions:
   a. 23.8" L x 17.8" W x 17.8 H (with printer)
   b. Chamber: 11" diameter x 18" deep
   c. Standard Tray, Large: 9" x15" x1 1/8"
   d. Standard Tray, Small 6 5/8" x 15" x 1 1/8"
2. Weight:
   a. Weight with Empty Reservoir 99 lbs.
   b. Weight with Shipping Cartion 131 lbs.
   c. Water Reservior Capacity 1.4 Gallons to Full Mark useable volume is 1.0 gallons.
3. Water usage (per cycle)
   a. Standard Configuration 120 to 180 ml (varies depending on the cycle)
   b. Connected to Direct-to Drain Thermal Reduction system. (Vistacool™) 650 ml
   c. Chamber Pressure at 270 F 27.1 psi.
   d. Safety Valve setting 40 psi.
   e. Heat Emission 5 BTU / hr during operation
   f. Certifications:
      1) ASME Boiler & Pressure Vessel Code, Section VIII, Division 1
      2) Canadian Registration Number available

3) UL61010-1 / IEC 61010-2-040 / CAN/CSA C22.2, #61010-1 / CSA C22.2, #61010-2-040-07 part 2-040

4. Tray Dimension: 6.7” x 16.3” x 0.8”
5. No. of Trays: 3
6. Standard Unwrapped Cycle: Cold: 30 min., Hot 20 min.

C. Features:
1. Fill, sterilize, exhaust and dry at the touch of a button.
2. Closed doors active drying system to maintain sterility and ensure efficient drying of packs and pouches.
3. High efficiency air pump circulates hot air after the sterilization cycle for fast drying.
4. HEPA filter .2um air filter (replaceable).
5. Pre-loaded cycles for unwrapped instruments, wrapped/packs, liquid and additional cycle.
6. All program parameters can be customized and stored.
7. Automatic shut-off at the end of both the sterilization and dry cycles.
8. Audible and visual cycle interruption alert.
9. Double safety locking device prevents door from opening while chamber is pressurized.
10. Low water sensor prevents activation of sterilization cycle when there is insufficient water in the chamber or reservoir.
11. Power outage recovery system.
12. Door design prevents steam from coming in contact with control panel.
13. Two year parts and labor warranty.

2.18 WET TREATMENT LIFT TABLE (EQUIPMENT ITEM #AE-18)

A. Manufacturer: (Basis of Design) Matrx by Midmark Canis Major (800) MIDMARK.

B. Model Number: CMDT-45 Midmark Wet table, 45” without scale

C. Features:
1. The shallow tub table and rack is constructed of stainless steel. Other metal components are powder coated for both chip and scratch resistance.
2. The back modesty cover fully encases all moving parts.
3. Temperature controlled water with ultralight 8’ sprayer.
4. Removable hair trap and easy clean drain.
5. Internal sensor and peristaltic pump for automatic draining.
6. 300 lb Maximum Lift.
7. Powered by medical-grade electric actuator for maintenance-free quiet, smooth lift.
8. Lowers to within 7” of floor and rises to 44”
9. 110 AC @ 10 AMP power

2.19 NARCOTICS SAFE (AE-19)

A. Manufacturer: Midmark (Basis of Design)

B. Model No. 190-0200-03 Narcotics Cabinet
1. 12” H x 16” W x 8” D

2.20 SCALES (EQUIPMENT ITEM #AE-20)

A. Manufacturer: Midmark (Basis of Design)

B. Model Number: 110-3110-00 Platform Scale, Post Mount

C. Features:
1. Stainless steel drip edge
2. The stainless steel top provides long-lasting durability and easy wipe-down cleaning.
3. HOLD key on the remote display allows the animal’s weight to be retained after leaving the platform.
4. Large 44” Lx22” W size with 300 lb capacity is ideal for weighing medium to large animals.
5. AC or battery power with low battery indicator and auto-off feature to extend battery life.
6. Adjustable feet for easy leveling.
7. Tare feature for weighing using baskets or crates.
8. Can be mounted on a variety of lift tables.

2.21 ICU CAGES (EQUIPMENT ITEM #AE-21) TYPES A AND B

A. ICU CAGES (EQUIPMENT ITEM #AE-21A)
1. Manufacturer – Shor-line, 800-444-1579 (Ext. 2351) (Basis of Design)
2. Model No. – Custom assembly of 16 cages with assisted care console (ACC)
3. Sizes:
   a. 902.2430.70 24” x 30” 44lbs Qty.16
4. Assisted Care Console (ACC)
   a. 802.2400.12 ACC III, 24” H 14lbs. Qty.14
5. Material – Stainless Steel
   a. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs and gypsum board to create a fully recessed appearance.
   b. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

B. ICU CAGES (EQUIPMENT ITEM #AE-21B)
1. Manufacturer – Shor-line, 800-444-1579 (Ext. 2351) (Basis of Design)
2. Model No.:
   a. 902.0104.19 in:
      1) Pre-Op/Post-Op Dogs, Qty. 2 units = 8 Cages
3. Assisted Care Console (ACC)
   a. 802.2400.12 ACC III, 24” H 14lbs. Qty.6
4. Material – Stainless Steel
   a. These cages (2 high) will be built into the wall as a fully recessed appearance on a 2x4 metal base 12” high, verify height. They will be framed in above the cage up to the ceiling forming a furrdown above the cages using wood studs and gypsum board to create a fully recessed appearance.
   b. Provide stainless steel trim at each end where cages are recessed into the wall to create a trim and neat final appearance.

2.22 CAT PET DOOR (EQUIPMENT ITEMS #AE-22)

A. Manufacturers – Hale (800)646-4773

B. Model: Wall Model Extruded Aluminum frame. Double flaps of 3/16” Clear PVC vinyl.

C. Size: Medium size – Interior space 8½“ x 12½“. Custom tunnel length to fit wall thickness.

D. Features: Sliding security cover – 3/16” Lexan® polycarbonate sheet. Weather stripping – Flap is surrounded by ½” nylon pile for maximum insulation. Nylon is woven into a backing 9/32” wide and 1/32” thick. Olefin Carpet – Stain,

2.23 CATIO ENCLOUSURE PANELS (EQUIPMENT ITEM #AE-23)

A. Manufacturer
1. Midmark (formerly Mason Company, (800)543-5567) (Basis of Design)
2. Shoreline, 888-551-4062
3. Direct Animal Products, 940-433-5468
4. LGL Animal Products, Inc. 979-690-3434

B. Materials
1. Stainless Steel

C. Features:
1. Perimeter frame and internal bracing shall consist of 1” x 16 gauge (.060” wall) square 304 A-554 welded stainless steel tubing with 180 grit polish. Each corner of the frame shall be TIG welded. Wire grids shall be constructed of 304 stainless steel wire 1/8” in diameter in the vertical direction with 1 5/8” spacing between wires, and 304 stainless steel wire 1/4” in diameter in the horizontal direction with 6” or less spacing between wires. Horizontal and vertical wires shall be resistance welded at each juncture. Provide weep holes in the bottom of stainless steel tubes.
2. Panels are to be attached to the floor, soffit, walls, and other panels. No gaps are to be exceed 2”.

D. Installation – Install panels level, plumb, and true to line to enclose Catio, as shown on the Animal Equipment Drawings, between columns and building wall proved by the General Contractor. Install from foundation up to soffit to form a complete enclosure.

2.24 ANESTHESIA MACHINE (EQUIPMENT ITEM #AE-24)

A. Manufacturer: Supera

B. Model No.: Pureline M6000 Anesthesia Machine With Oxygen Concentrator

C. Provide Vaporizer Model No. VAP 3050 (Isoflurane) / VAP 3150 (Sevoglurane) (Verify with Owner)

2.25 AUTOMATIC DOG AND PUPPY WATERER (EQUIPMENT ITEM #AE-25)

A. Manufacturer and Model No. (Basis of Design) – Nelson Manufacturing Company, 888-844-6606, http://www.nelsonmfg.com, Model 1200

B. Materials – Stainless Steel

C. Operation – Automatically refills water bowl with stainless steel float guard. Protects float and valve assembly.

D. Installation – Mounted one automatic waterer in each dog kennel with a maximum of 4" clearance under the bowl to allow for cleaning under and for puppies to be able to reach the water. Cold water piping to each unit to be concealed in wall. Provide brass shut-off valve above ceiling at each unit. Configure water piping so no piping is exposed in the dog run such that the dog cannot chew on it.

2.26 PRESSURE WASHING SYSTEM (EQUIPMENT ITEM # AE-26)

A. Manufacturers – SMT Spray Master Technologies, Rogers AR., Phone 800-548-3373 (Basis of Design)

B. Refer to Section 116010 for Specifications.

C. Refer to Animal Equipment drawings for layout of central units and remote stations.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Installation to be completed by factory-trained and approved personnel and the final installation on each item warrantied by the Manufacturer.

3.2 ADJUST AND CLEAN

A. Testing: Test each item to verify proper operation. Make necessary adjustments.

B. Accessories: Verify that accessory items required have been furnished and installed.

C. Safety: Ensure there are no sharp edges or protrusions that would be harmful to animals or people.

D. Cleaning: Remove packing material from equipment items and leave units in clean condition, ready for operation.

E. Provide training to Owners as needed, and provide Owner's Manuals as well as, Cleaning and Care Instructions for all equipment.

END OF SECTION

SECTION 116010

PRESSURE WASHING SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install equipment described in the Drawings and described in this Section.

B. Manufacturer shall include, but not be limited to the following equipment. Manufacturer shall engineer, fabricate and install pressure washing systems.
   1. Manufacturer shall provide engineering and services as required to provide a fully engineered, operational and component assembled system.
   2. Design of all piping and other accessories within the system boundaries.
   3. Arrangement of all piping and equipment on the system to allow for proper equipment access.
   4. Creation of preliminary and final I/O list.
   5. Assembly of a complete erection package, including the necessary requirements and specifications for field piping, and wiring, as well as for installing the equipment.
   6. Design of all wiring systems and supply of wiring interconnecting diagrams, schematics, and loop diagrams for all electrical equipment.
   7. Creation of O&M Manuals for the equipment.
   8. Purchasing, quality control, project management, scheduling services, transportation support, shop supervision, shop safety personnel, and all other project management services required to support the project.
   9. Manufacturer shall expedite the delivery of all equipment purchased in order to meet the schedule requirements; this includes continued correspondence with sub-manufacturers.
   10. Manufacturer shall include the following travel in their quote: as a minimum, one (1) trip to the site is required for equipment operation, safety, and maintenance training.
   11. Manufacturer is responsible for providing the correct specifications for materials of construction, relevant operating conditions including noise requirements and warranty requirements to all sub-manufacturers for all material and equipment purchased by Manufacturer.

1.2 RELATED WORK

A. Section 042200 - Concrete Block Masonry (blocking)

B. Section 220500 - Plumbing Requirements

C. Section 260100 - Electrical General Requirements

1.3 QUALITY ASSURANCE

A. Submit catalog cut sheets to the Owner for approval of the type, model, and finish of equipment and appliances.

B. Furnish items in proper operating condition and without any defects or damages to the finish.

C. Check and make necessary adjustments to insure that installed items operate faultlessly.

D. Manufacturer shall submit the following to the A/E for system approval, and shall not begin construction until the materials have been approved by the customer and A/E.
   1. Layout Drawing of central units and remote stations.
   2. Connections List
   3. Detailed Operation Manual

E. Manufacturer must demonstrate the system to the Owner and set up a local service firm.

1.4 REFERENCES

A. The Kennel Cleaning System covered by this specification shall meet the relevant portions of the following codes:
   1. AFBMA Anti-Friction Bearings Manufacturers Association
   2. ANSI American National Standards Institute
   3. ASME American Society of Mechanical Engineers
   4. ASTM American Society for Testing and Materials

5. NEC National Electrical Code
6. NEMA National Electrical Manufacturers Association
7. NFPA National Fire Protection Association
8. OSHA Occupational Safety and Health Act
9. SDI Steel Deck Institute
10. UL Underwriters Laboratory

1.5 SUBMITTALS

A. Provide manufacturer's literature for Owner's approval before ordering.

B. Manufacturer shall supply with the quote a schedule of fabrication and delivery (including delivery of documentation) that meets the stated job requirements.

C. 2 sets of O&M Manuals shall be submitted with the system, and an electronic copy shall be provided.

1.6 WARRANTY

A. Turn over to the Owner guaranty or warranty certificates for the furnished equipment and appliances.

B. Equipment to be free from manufacturing defects for one (1) year from date to be determined as part of quoting process (warranty will begin after system startup and acceptance).

C. Repair or replace parts or materials found to be defective, provided written or verbal notice of the alleged defect is provided within one (1) year from date of the start of the warranty.

D. The warranty is not intended to include:
1. Ordinary wear and tear, erosion, corrosion.
2. Warranty labor at the customer site
3. Unintended use, misuse, abuse or improper handling, operation or storage by any third party.
4. Inability of Manufacturer or its subcontractors to make timely delivery on account of Acts of God, labor troubles, intervention or any civil or military authority, material shortages, delays by suppliers or any other cause reasonably beyond its control.

E. Equipment parts of accessories manufactured by others will carry the warranty (if any) of the manufacturer, or will be warranted by the system manufacturer, whichever warranty is longer.

F. Manufacturer is to provide diagnostic technical services (usually within the first 8 hours of notification of a problem).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. SMT Spray Master Technologies, Rogers AR., Phone 800-548-3373 (Basis of Design)

2.2 EQUIPMENT

A. Manufacturer shall include, but not be limited to the following equipment: Manufacturer shall engineer and fabricate a self-contained, ventilated Alkaline Hydrolysis System which shall contain the following major pieces of equipment, which are supplied by Manufacturer unless otherwise noted.

B. Central Units: 300-5131 PowerClean 2.0C, wall or rack mounted units both with Post Pump Chemical Injection for use with Rescue disinfectant.
1. 2 HP Motor
2. Dual Chemical Injection System post pump.
3. Master Control Panel with 24 V Lead
4. Thermal Limit Switch
5. Water Level Float Switch Assembly
6. Automatic Line Pressure Relief Manifold with SS Bleeder Valve
7. Manifold Hose
8. 6’ Water Inlet Supply Hose
9. Maintenance Kit: Water filter, replacement filter and one hydraulic oil with 5.7 GPH metering chemical pump & hour meter.
10. 10. 2.2 GPM, @ 1100 PSI, 115V
11. Two chemical delivery system.

C. Remote Stations: quick connect remote stations to be located at various locations of all animal housing areas, both inside and outside as needed to clean all animal housing areas.
   1. 300-1260 Recessed Remote for New Masonry, Top Entry, SS Tubing and Rotary Switch.
   2. 300-1243 Universal Remote Sleeve with Grippers (to be installed during construction of the walls).
   3. 300-1620- ½" Stainless Steel Tubing and Installation Supply Kit (100' each) OR adequate High Pressure Hose Installation Kits.
   4. 300-2545 Winterize Valve Kit (Outdoor Remote Locations).
   5. 042-0014 1/2" SS Compression Tee (tube to tube).
   6. 300-1358 Deluxe Animal Care Package with "Shorty" Vari Nozzle Low Pressure Chemical Application and High-Pressure Rinse Gun, Trap Shooter, Wall and Tile Brush and Stainless-Steel Accessory Rack.
   7. 300-5258 Portable Hose Reel without Hose or 300-5240 Wall Mounted Hose Reel or 300-0679 Retractable Hose Reel with 50' High Pressure Hose.
   8. 300-…. High Pressure Hose up to 100' Long.

D. Each remote station requires a 2" PVC conduit chase within the wall from the location of the remote station to the space above an accessible ceiling. The material and labor for the PVC chase is not supplied by SMT and will need to be supplied and installed by the contractor, prior to the installation of the SMT system.

PART 3 - EXECUTION (NOT USED).

3.1 INSTALLATION

A. In accordance with layout shown on Drawings and in strict conformity with the manufacturer's recommendations.

B. Furnish necessary blocking, filler pieces, angles, moldings, and other finish items for complete installation and faultless operation of the equipment.

C. Installation: The entire system shall be installed by the Manufacturer's trained staff all in strict accordance with the Manufacturer's instructions and requirements.

3.2 QUALITY ASSURANCE AND CONTROL

A. The Manufacturer shall provide qualified personnel to assist in the equipment start-up and to provide operational and maintenance training to customer personnel if the customer selects that option.

3.3 DELIVERY AND STORAGE

A. The System shall be protected against water, dust and damage to the equipment during shipment.

B. The System shall be shipped directly to the Customer at the address listed in the purchase order. Freight shall be estimated and added to the price of the project.

3.4 START-UP AND ACCEPTANCE

A. Submit Operation Manual to the customer

B. Provide telephone technical coaching during startup and operation as required by the customer at no additional cost (standard with the system)

C. Verify system operating performance.

END OF SECTION

SECTION 12 2413
ROLLING WINDOW SHADES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manually operated sunscreen roller shades – typical.
B. Electrically operated sunscreen roller shades.

1.2 RELATED SECTIONS

A. Section 06 1000 – Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
B. Section 09 2900 Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
C. Division 26 - Electrical: Electric service for motor and controls.

1.3 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
B. NFPA 70 - National Electrical Code.
C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 3300.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams.
   6. Signed letter from the manufacturer stating the subcontractor is an authorized dealer and will be providing shades for this project.
C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
D. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
F. Installer must provide a signed letter from the manufacturer stating they are an authorized dealer and must provide a copy of their subcontractor’s license proving they have been in the window covering business for fifteen years.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of fifteen years in the window covering business (based on the issue date of the subcontractor license) in the state of the project with a minimum of fifteen years experience in installing products comparable to those specified in this section. Installer must have completed a minimum of five comparable projects. Installer must provide a signed letter from the manufacturer stating they are an authorized dealer and must provide a copy of their subcontractor's license proving they have been in the window covering business in the state of Arizona for fifteen years.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large- scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

E. Requirements for Electronic Hardware, Controls, and Switches:
   1. Roller shade hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

C. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: MechoShade Systems, Inc.; 42-03 35th Street, Long Island City, NY 11101. Local representative: Kathleen Powers: T 480-231-7417, email: kathleenp@mechoshade.com

B. Armstrong-AXIOM SHADE POCKET – NO POCKET

C. Nysan Shading Systems

D. Draper

2.2 APPLICATIONS/SCOPE

A. Roller Shade Schedule:

1. Shade Type 1: Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.

2. Shade Type 2: Motorized interior solar roller shades in all exterior windows of rooms and spaces shown on Drawings, and related motor control systems. Shades with the top of the shade more than 25' AFF or/and bottom of shade is 15'0" above finished floor must have catch pin brackets and guide cables. For clerestory windows in entry corridor, each elevation must be controlled separately.

2.3 SHADE CLOTH

A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., EuroTwill "6000" Series: 0.010 diameter (0.254 mm) non-raveling vinyl/polyester yarn, fabric thickness 0.025 inches (0.635 mm). Solar shadecloth containing fiberglass is not acceptable.

1. Extra Dense Twill Weave "6000" series, 2-3 percent open.
2. Color: 6017

2.4 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
2. Shade band and Shade Roller Attachment:
   a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in

diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.

b. Provide for positive mechanical engagement with drive / brake mechanism.

c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.

d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.

e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb- to-jamb, unless specifically indicated otherwise.

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:

1. Bottom hem weights.
2. Concealed hemtube.

C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

D. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

E. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

2.6 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced

polyester will not be acceptable.

B. Motorized Shade Hardware and Shade Brackets:
   1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
   2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
   3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer's design criteria).
   4. Provide brackets with catch pins for shades with the following mounting conditions: top of shade mounted 25'0" or more above finished floor or/and bottom of shade is 15'0" above finished floor.
      a. Provide shade hardware constructed of minimum 10GA (0.1345") thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
      b. Provide minimum rate of withstand loads of 250 Lb to system with two to four pins.

C. Manual Operated Chain Drive Hardware and Brackets:
   1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
   2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
   3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
   4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
   5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
   6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
   7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
   8. Drive Bracket / Brake Assembly:
      a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded

shades.

b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.

c. The brake shall be an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.

d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 MOTOR AND MOTOR CONTROL SYSTEMS. INTELLIGENT

ENCODED MOTOR DRIVE SYSTEMS

A. Electronic Drive Unit (EDU):

1. Intelligent Encoded EDU, and Control System: Tubular, asynchronous (non-synchronous) EDU's, with built-in reversible capacitor operating at 120VAC/60Hz, single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each EDU.
2. Quiet - 42 – 46 db within 3 feet open air.
3. Conceal EDU's inside shade roller tube.
4. Maximum current draw for each shade EDU of 2.3 Amps at 110VAC.
5. Use EDU's rated at the same nominal speed for all shades in the same room.
6. Use EDU's with minimum of 34RPM, that shall not vary due to load / lift capacity.
7. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade EDU and tube assembly.

B. EDU System: (software, two-way communication): Specifications and design are based on the Intelligent EDU Control System, WhisperShade®IQ® System) as manufactured by MechoSystems. Other systems may be acceptable providing all of the following performance capabilities are provided. EDU and control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.

1. EDU shall support two methods of control.
   a. Local Dry Contact Control Inputs:
      1) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to the upper and lower limits.
      2) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to local switch preset positions.
      3) Shall support configuring the EDU under protected sequences so that a typical user would not change the EDU's setup. At a minimum the configuration should include setting limits, setting custom presets and configuring key modes of operation.

b. Network Control:
   1) EDU shall be equipped with a bi-directional network communication capability in order to support commanding the operation of large groups of shades over a common backbone. The network communication card shall be embedded into the tubular EDU assembly.

2. Upper and lower stopping points (operating limits) of shade bands shall be programmed into EDU's using either a hand held removable program module / configurator or a local switch.
3. Alignment Positions: Each EDU shall support a minimum of 133 repeatable and precisely aligned shade positions (including limits and presets).
   a. All shades on the same switch circuit or with the same network group address with the same opening height shall align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
   b. Shades of differing heights shall have capability for custom, aligned intermediate stop positions when traveling from any position, up or down.
   c. Alignment of shades mechanically aligned on the same EDU shall not exceed +/- 0.125 inches when commanded to the same alignment position.
   d. Alignment of shades on adjacent EDU's shall not exceed +/- 0.25" inches when commanded to the same alignment position.
   e. Local Switch Presets: A minimum of 3 customizable preset positions shall be accessible over the local dry contact control inputs and over the network connection.
      1) Upon setting the limits for the shade EDU these preset positions shall automatically default to 25%, 50% and 57% of the shade travel.
      2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator or local switch shall be capable of customizing the position of these presets.
   f. Network Presets: A minimum of 29 customizable preset positions (including the 3 local switch presets) shall be accessible via network commands.
      1) Upon setting the limits for the shade EDU these preset positions shall automatically default to the lower limit unless customized elsewhere.
      2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator shall be capable of customizing the position of these presets.
4. Network Control:
   a. The system shall have the capability of two-way digital communication with the EDU's over a common backbone.
   b. Each EDU shall possess 8 addresses capable of being employed for various levels of group control. These addresses shall be configurable via a handheld configurator and/or a PC controller. A 9th unique address shall enable the EDU(s) to be independently controlled and configured over the network via a handheld configurator and/or a PC controller.
   c. Low Voltage Communication Network Implementation.
      1) The low voltage network shall employ a bus topology with daisy chained network connections between nodes over a CAT5 cable (4 UTP) or over a 2 UTP cable employing at

least 1 pair at 16 AWG for power and 1 pair at 22 AWG for data.

2) The low voltage network (+/- 13VDC) shall be powered by the nodes attached to it. These nodes could be line voltage powered EDU's attached to 120 VAC or 230 VAC. Alternatively, low voltage nodes shall be powered typically by a centralized low voltage power supply. If a CAT5 network cable is employed and the node draws less than 1W then the node may be powered by DC power supplied by an associated line voltage EDU.

3) Network Capacity: 4000 ft max, 250 nodes max

(a) The number and size of a centralized DC supply shall vary depending upon the network requirements.

5. Operating Modes:
   a. Uniform or Normal Modes of Operation:
      1) Uniform mode shall allow for shades to only move to defined intermediate stop positions to maintain maximum uniformity and organization.
      2) Normal Mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.
6. Wall Switches:
   a. Shades shall be operated by, 5, 7, or 10-button low voltage standard switches, or programmable intelligent switches [IS]. Standard switch shall be wired to a bus interface and the bus interface will be programmed to transmit an address for the local switch.
   b. Intelligent switches may be installed anywhere on the bus line. Each IS shall be capable of storing one control level address to be broadcast along the bus line.
   c. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table.
   d. IS shall provide for interface with other low voltage input devices via a set of dry contact terminals located on the switch.
   e. Standard switch or IS may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

2.8 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings as indicated on the Drawings

1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

B. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller

shade brackets.

5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Coordinate the following with the roller shade installer/dealer:

1. Main Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer’s requirements, as indicated on the mechanical and electrical drawings.
2. Main Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
3. Electrician shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer. Electrician shall run low voltage as required. Modular plugs shall be crimped USOC on both ends.
4. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/ control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum- rated, or installed in conduit, as required by the electrical code having jurisdiction.
5. Main Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from

binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

E. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 9313

BICYCLE RACKS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Bicycle racks.

B. Related Requirements:
   1. Section 03 3053: 'Miscellaneous Cast-In-Place Concrete' for installation.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A53/A53M-12, ‘Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless’.
      b. ASTM A123 /A123M-13, ‘Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products’.
      c. ASTM A500/A500M-13, ‘Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes’.
      d. ASTM D3451-06(2012), ‘Standard Guide for Testing Coating Powders and Powder Coatings’.
      e. ASTM D7378-10, ‘Standard Practice for Measurement of Thickness of Applied Coating Powders to Predict Cured Thickness’.
      f. ASTM D7803-12, ‘Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating’.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Manufacturers' Instruction:
      a. Provide installation instruction including mounting and tolerances.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
   1. Protect racks and finish from damage during handling and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Type One Acceptable Manufacturers:
   1. Columbia Cascade, Portland, OR www.timberform.com.
   2. Creative Pipe Inc, Hermosa Beach, CA www.creativepipe.com.

3. Huntco Supply LLC, Portland, OR www.huntco.com.
4. Madrax, Wannakee, WI www.madrax.com.
5. Equal as approved by Architect before bidding. See Section 01 6200.

B. Type One Acceptable Manufacturers for long term bicycle parking:
1. Cycle Safe, Inc., Portland, OR www.cyclesafe.com.
2. Equal as approved by Architect before bidding. See Section 01 6200.

2.2 MANUFACTURED UNITS

A. Bicycle Rack:
1. Design: Serpentine Style:
2. Steel Pipe: ASTM A53 Type F or Type S, Schedule 40.
3. Mounting: In-Ground.
4. Bicycle Capacity: As shown on drawings.

B. Fabrication:
1. Cast-in-place model fabricated from 2-3/8 inch (60.3 mm) outside diameter, 0.154 inch (3.9 mm) wall, Schedule 40 steel pipe.

C. Finish:
1. Powder coated after complete fabrication:
   a. Preparation:
      1) Meet ASTM standards for powder coating.
      2) Steel must be free of any scale, paint, varnish, grease, or rust.
      3) Chemical wash and rinse.
      4) Apply corrosion-inhibiting iron phosphate treatment.
   b. Apply powder coating.
2. Color: As selected by Owner from Manufacturers standard colors.

D. Type One Acceptable Products:
1. Original CycLoops by Columbia Cascade.
2. Thunderbolt Series by Creative Pipe.
3. BR Series by Huntco Supply.
4. Heavy Duty Winder by Madrax.

2.3 MANUFACTURED UNITS LONG TERM BICYCLE PARKING

A. Bicycle Storage Locker:
1. Locker Dimensions:
2. Height: 4 feet, 2 1/4 inches.
3. Width: (Starter) 2 feet, 9 inches
4. Depth: 6 feet, 5 1/2 inches.
5. Row Length: Varies depending upon banking configurations.

B. Finish:
1. Color: As selected by Owner from Manufacturers standard colors.

C. Type One Acceptable Products:
1. Series: CycleSafe EcoPark; Single tier.

PART 3 - EXECUTION

END OF SECTION

SECTION 13 31 23

PRE-ENGINEERED FABRIC SHADE STRUCTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. A single, State of California-licensed fabric shade structure contractor shall be responsible for the design, engineering drawings, fabrication, supply, and erection of the work specified herein, including foundations. The intent of this specification is to have only one shade contractor be responsible for all of the functions listed above.

1.3 SUBMITTALS

1.3.1 With Bid Submittals:

A. Provide proof of existing reference sites with structures of similar project scope and scale, and that are engineered to and approved to CBC 2022 specifications.

B. Provide a minimum of 7 fabric samples to demonstrate fabric color range, and a digital (PDF) or paper document showing a minimum of 9 powder coat color choices. Also, provide a letter of authorization from the fabric manufacturer delineating authorized use of the specified fabric.

C. Provide proof of all quality assurance items, including;

1. A list of at least 3 reference projects of similar scope in California that have been installed a minimum of 12 years and include at least one of similar size and complexity.
2. Proof of General Liability, Professional Liability, and Umbrella insurance, as per Section 1.4B.
3. Proof of current State of California Contractor's License, Class A or Class B.
4. Proof of current City of Los Angeles Approved Fabricator license.
5. Proof of a minimum of $6,000,000 aggregate bonding capacity.
6. Proof of current IAS certification, as per Section 1.4D.
7. Proof of an Annual Maintenance Inspection Program.
8. Proof of a Corporate Safety and/or Injury & Illness Prevention Program.

1.4 QUALITY ASSURANCE

Fabrication and erection are limited to firms with proven experience in the design, fabrication, and erection of fabric shade structures, and such firms shall meet the following minimum requirements. No substitutions shall be allowed for the following:

A. A single shade structure contractor shall design, engineer, manufacture, and erect the fabric shade structures, including the foundations, and shall provide a dedicated Project Manager throughout the entire Scope of Work related to the shade structure(s). The award shall be in whole and not in part.

B. All bidders shall have at least 15 years' experience in the design, engineering, manufacture, and erection of fabric shade structures, engineered to California Building Code requirements with similar scope, and a successful construction record of in-service performance. Bidders are required

to provide examples of multiple installations of a variety of fabric shade structure models that include at least one of similar size and design that have been installed for at least 12 years.

C. All bidders shall provide proof with bid submittal of a minimum of $1,000,000 General/Public Liability insurance, $3,000,000 Professional Liability (PL) insurance, and additional $5,000,000 Umbrella/Excess Liability insurance.

D. All bidders shall be a currently licensed contractor in the State of California and shall provide proof of a minimum aggregate bonding capacity of $6,000,000 with bid.

E. Manufacturer shall have a City of Los Angeles Approved Fabricator license and be accredited by the IAS (International Accreditation Service) for Structural Steel Fabrication under CBC 2022, Section 1704.2.5.2.

F. The fabric shade structure contractor shall have a Corporate Quality Control program (manual), which describes their complete quality assurance program.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fabric shade structure(s) shown on the drawings in relation to the property survey and existing structures and verify locations by field measurements prior to erection of the fabric shade structure(s).

1.6 WARRANTY

A. The successful bidder shall provide a 12-month warranty on all labor and materials.

B. A supplemental warranty from the manufacturer shall be provided for a period of 10 years (pro-rated) on fabric and 10 years on the structural integrity of the steel, from date of substantial completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 – PRODUCTS

2.1 GENERAL

A. The structures shall be manufactured by Shade Structures, Inc., d/b/a USA SHADE & Fabric Structures or approved equal.

B. Contact: USA SHADE & Fabric Structures
1085 N. Main Street, Suite C
Orange, CA 92867
Contact: Eric Roys
Phone: 909-927-7567
Email: eric.roys@usa-shade.com

C. To qualify as an approved equal, please submit product documentation, fabric samples, and all quality assurance criteria, as per Section 1.4, at least 10 days prior to bid in order to be considered. No substitutions will be allowed after the deadline. Any approval of alternate manufacturers shall be by addendum prior to the bid date and shall not be allowed without written notification.

D. The fabric shade structure(s) shall conform to the current adopted version of the California Building Code 2022.

E. All fabric shade structures are designed and engineered to meet the minimum of 115mph Wind Load, Risk Category II, Exposure C, and Seismic (earthquake) Load based on Seismic Design Category D, Seismic Risk Category II, and a Live Load of 5psf. All fabric shade structures shall be engineered with a zero wind pass–through factor on the fabric.

H. Steel:

1. Fabrication of the steel structures shall be performed by Shade Structures or an authorized licensee. Material testing (or mill certificates) and inspection of welding shall be conducted per CBC 2022 sections 1704A, 1705A, 1705A.2, and Table 1705A.2.1.

2. All galvanized steel tube products manufactured by Allied Tube & Conduit for this structure shall be, and conform to ASTM A500-16, in its' entirety.

   Round tube 42,000 psi yield stress minimum / 48,000 psi tensile stress minimum

3. All structural shapes shall be cold formed HSS ASTM A500 Grade B, unless otherwise noted. Typical mechanical properties achieved for HSS products:

   Square and rectangular 46,000 psi yield stress / 58,000 psi tensile stress
   Round pipe 42,000 psi yield stress / 58,000 psi tensile stress

4. All plates products shall comply with ASTM A572 Grade 50.

I. Bolts:

1. All stainless steel bolts shall comply with ASTM F-593, Yield Strength= 65 ksi, Tensile Strength=100 ksi minimum, Alloy Group 1, Condition CW1. All nuts shall comply with ASTM F-594 Alloy Group 1, Condition CW1. Referring to RCSC, ASTM T-593 is not considered as high strength bolts.

2. All high strength bolts shall comply with ASTM F3125 Grade A325 N (galvanized). All nuts shall comply with ASTM A563DF, and washers shall comply with ASTM F436.

3. Cold-formed steel members shall be 55% aluminum zinc alloy coated per ASTM A792/A792M standard in accordance to AISI S200 Table A4-1, CP 90 coating designation. All exposed steel fasteners shall be stainless steel (type 304 minimum), hot dip galvanized (ASTM A153, Class D minimum or ASTM F2329), or protected with corrosion preventive coating that demonstrated no more than 2% of red rust in minimum 1,000 hours of exposure in salt spray test per ASTM B117. Zinc-plated fasteners do not comply with this requirement.

J. Welding:

1. All welding to conform with American Welding Society standards and shall be inspected by an AWS/CWI Inspector. AWS D1.1 for hot rolled. AWE D1.3 for sheet/cold formed. AWS D1.8 Seismic Supplement.

2. Shop connections shall be welded unless noted otherwise. Field connections shall be as indicated on the drawings (if required). All fillet welds shall be a minimum of 3/16" ER70SX electrodes unless otherwise noted. Either SMAW or GMAW is acceptable.

K. Powder Coating:

1. All structural steel shall be powder coated with one shop coat (2.5 mils min.) of zinc-rich primer, undercoat, and finish coat, or equivalent paint system. This coat is a weather resistant powder coating based on polyester TGIC (manufactured by Sherwin Williams, Asko Nobel, PPG or Tiger Drylac). To achieve optimum adhesion, it is recommended that the proper treatment and drying take place before coating. Polyester powder (TGIC) specifications shall be as follows:

pencil hardness (ASTM D-3363). - humidity (ASTM D-2247).
solvent resistance (PCI method) - 50 dbl rubs sl. Softness.

L. Tension Cable:

1. For fabric attachment use 3/8" 7x19 galv. Cable per ASTM A1023A, ASTM 1023M-02, with a breaking strength value of 14,400 lbs. Cable shall be tensioned to 250 lbs minimum.

2. Cables shall be fed through the fabric sleeves around the perimeter of the canopy and tensioned until the fabric panels (designed purposely undersized) reach a taut appearance. Any long term cable sag shall be minimized during the maintenance re-tighting visits as required.

M. Fabric Roof Systems:

1. UV Shade Fabric:

   a. Colourshade® FR UV shade fabric is made of a UV-stabilized, high-density polyethylene (HDPE), as manufactured by Multiknit® (Pty) Ltd. HDPE mesh shall be a heat-stentered, three bar Rachel-knitted, lockstitch fabric with one monofilament and two tape yarns to ensure that the material will not unravel if cut. Raw fabric rolls shall be 9.8425 feet wide.

   b. Fabric Properties:
      ~ Life Expectancy: minimum 8 years with continuous exposure to the sun
      ~ Fading: minimum fading after 5 years (3 years for Red)
      ~ Fabric Mass: 5.31 oz/yd^2 ~ 5.6 oz/yd^2 (180gsm ~ 190gsm)
      ~ Fabric Width: 9.8425 feet (3m)
      ~ Roll Length: 164.04 feet (50m)
      ~ Roll Dimensions: 62.99 inches x 16.5354 inches (160cm x 42cm)
      ~ Roll Weight+/- 66 lbs (+/- 30kg)
      ~ Minimum Temp: -13°F (-25°C)
      ~ Maximum Temp: +176°F (80°C)

   c. Fabric shall meet the following flame spread and fire propagation tests:

      1) ASTM E-84
      2) NFPA 701 Test Method 2

2. California's Office of the State Fire Marshal, Registered Flame Resistant Product

3. Stitching & Thread:
   a. All sewing seams are to be double-stitched.
   b. The thread shall be GORE® TENARA® mildew-resistant sewing thread, manufactured from 100% expanded PTFE (Teflon™). Thread shall meet or exceed the following:
      1) Flexible temperature range
      2) Very low shrinkage factor
      3) Extremely high strength, durable in outdoor climates
      4) Resists flex and abrasion of fabric
      5) Unaffected by cleaning agents, acid rain, mildew, salt water, and is unaffected by most industrial pollutants
      6) Treated for prolonged exposure to the sun
      7) Rot resistant

4. Shade and UV Factors:

   a. Shade protection and UV screen protection factors shall be as follows:

Color	UV Block %	Shade %
Blue	85%	80%
Green	85%	80%
Red	86%	80%
Silver	81%	80%
Desert Sand	92%	80%
Terracotta	82%	75%
Yellow	89%	80%

PART 3 – EXECUTION

3.1 INSTALLATION

A. The installation of fabric shade structures shall be performed by the manufacturer which shall be bonded and holding a current contractor's license with the State of California's Contractors State License Board. All installation personnel must have experience in the erection of tensioned fabric structures.

B. The installation shall comply with the manufacturer's instructions for assembly, installation and erection, per approved drawings.

D. Foundations:

1. Foundation design based on CBC 2022, Table 1806A.2, Soil Class 5 (allowable foundation pressure 1500 psf).

2. All anchor bolts set in new concrete (when applicable) shall comply with ASTM F-1554 Grade 55 (galvanized per ASTM A153, Class D minimum or ASTM F2329).
Anchor bolt's embedment needs to be as follow:
anchor bolt Ø1 1/4" 30 in (minimum embedment)

3. All non-shrink grout shall have a minimum 28 days compressive strength of 5000 psi, and shall comply the requirements of ASTM C109, ASTM C939, ASTM C1090, ASTM C1107, when applicable.

4. Footings and full rebar cages shall be drilled, set, and poured as per manufacturer's specifications with full rebar cage, as per approved manufacturer's engineered drawings.

END OF SECTION 13 31 23

SECTION 14 2400
MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
   1. Standard pre-engineered hydraulic passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Jack(s).
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
   2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   4. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   6. Division 16 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
   7. Division 22 Plumbing
      a. Sump pit and oil interceptor.
   8. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
   1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.

2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand

frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.

25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
   1. Owner's manuals and wiring diagrams.
   2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified
   5. LEED Gold certified elevator manufacturing facility.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
    1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
    2. Building Code: National.
    3. NFPA 70 National Electrical Code.
    4. NFPA 80 Fire Doors and Windows.
    5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
    6. Section 407 in ICC A117.1, when required by local authorities
    7. CAN/CSA C22.1 Canadian Electrical Code
    8. CAN/CSA B44 Safety Code for Elevators and Escalators.
    9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:

    1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
    2. Arrange for inspections and make required tests.
    3. Deliver to the Owner upon completion and acceptance of elevator work.

F. Sustainable Product Qualifications:
    1. Environmental Product Declaration:
        a. GOOD: If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
        b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.
    2. Material Transparency:
        a. GOOD: Provide Health Product Declaration at any level
        b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
        c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.
    3. LEED v4 – Provide documentation for all Building Product Disclosure AND Optimization credits in LEED v4 for product specified.
    4. Living Building Challenge Projects: Provide Declare label for products specified.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
   1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
   2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Design based around TK Elevator’s endura Machine Room-Less hydraulic elevator.

2.02 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in 1.03.9 of this specification.

B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

C. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture’s standard selections.

D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.

E. Flooring by others.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper viscosity grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated

floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.04 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
   1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
   2. An oil hydraulic pump.
   3. An electric motor.
   4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
   5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
   6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
   7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)

8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.05 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
   2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
   3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
   2. Reveals and frieze: a. Reveals and frieze: Powder Coated
   3. Canopy: Cold-rolled steel with hinged exit.

4. Ceiling: Downlight type, metal pans with suspended LED downlights and dimmer switch. Number of downlights shall be dependent on platform size with a minimum of six. The metal pans shall be finished with a stainless steel, no. 4 brushed finish.
5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.
7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
   3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.

4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment: Not Applicable

F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:

1. ADA Phone - Code Compliant Cellular Connectivity

2. A17.1 2019 Code - Enhanced Communications

2.09 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
   1. Access to main control board and CPU
   2. Main controller diagnostics
   3. Main controller fuses
   4. Universal Interface Tool (UIT)
   5. Remote valve adjustment
   6. Electronic motor starter adjustment and diagnostics
   7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
   8. Operation of auxiliary pump/motor (secondary hydraulic power source)
   9. Operation of electrical assisted manual lowering
   10. Provide male plug to supply 110VAC into the controller
   11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.

E. Special Operation: Not Applicable

F. Digital Services:

Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment's state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-

factor authentication. Finally, this system must be self-contained and not require internet provision by others.

Along with the monitoring system, options are available.

ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

A17.1 2019 Code – Enhanced Communications: For jobs installed under enforcement of 2018 International Building Code or ASME A17.1-2019/CSA B44:19 Safety Code, contractor will provide a video camera necessary for viewing the elevator cab interior floor as well as a position indicator display in the cab operating panel capable of providing means of two-way, text-based communication when the emergency call button is engaged in the elevator car. These components, and associated cloud-based monitoring platform, will be non-proprietary in nature, allowing customization on where to direct emergency calls, while offering capability for any party to provide the emergency monitoring services.

2.10 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
    1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
        a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model: endura MRL Twinpost above-ground 1-stage
   2. Elevator Type: Hydraulic Machine Room-Less, Passenger
   3. Rated Capacity: 2100 lbs.
   4. Rated Speed: 80 ft./min.
   5. Operation System: TAC32H
   6. Travel: 14'-0"
   7. Landings: 2 total
   8. Openings:
      a. Front: 2
      b. Rear: 0
   9. Clear Car Inside: 5'-8" wide x 4'-3" deep
   10. Inside clear height: 7'-4" standard
   11. Door clear height: 7'-0" standard
   12. Hoistway Entrance Size: 3'-0" wide x 7'-0" high
   13. Door Type: One-speed | RH Side opening
   14. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
   15. Seismic Requirements: Zone
   16. Hoistway Dimensions: 7'-4" wide x 5'-9" deep
   17. Pit Depth: 4'-0"
   18. Button & Fixture Style: Traditional Signal Fixtures
   19. Special Operations: None
   20. Digital Services:
       ADA Phone - Code Compliant Cellular Connectivity

       A17.1 2019 Code - Enhanced Communications

END OF SECTION

SECTION 21 1313

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete wet-pipe fire sprinkler system as specified in Contract Documents.
   2. Furnish and install Firestop Penetration Systems for fire sprinkler system penetrations as described in Contract Documents.

B. Related Requirements:
   1. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
   2. Section 28 3100: 'Fire Detection and Alarm System' for fire detection and alarm annunciation panels including connection of tamper switches and flow detectors to alarm system.
   3. Section 33 1119: 'Fire Suppression Utility Water Distribution Piping'.

1.2 REFERENCES

A. Association Publications:
   1. Underwriters Laboratories, Inc.:
      a. UL Directory B, 'Fire Protection Equipment, Directory B' (2011).

B. Reference Standards:
   1. American Society of Mechanical Engineers:
      a. ASME B1.20.1-2013 'Pipe Threads, General Purpose, Inch'.
      b. ASME B16.1-2015, 'Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250'.
      c. ASME B16.3-2016, 'Malleable Iron Threaded Fittings: Classes 150 and 300'.
      d. ASME B16.4-2016, 'Gray Iron Threaded Fittings: Classes 125 and 250'.
      e. ASME B16.5-2017, 'Pipe Flanges and Flanged Fittings'.
   2. American Water Works Association:
      a. AWWA C606-15, 'Grooved and Shouldered Joints'.
   3. American Welding Society:
      a. AWA B2.1/B2.1M-2014, 'Specification for Welding Procedure and Performance Qualification', (5th Edition).
   4. ASTM International:
      a. ASTM A53/A53M-18, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
      b. ASTM A135/A135M-09(2014), 'Standard Specification for Electric-Resistance-Welded Steel Pipe'.
      c. ASTM A234/A234M-17, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
      d. ASTM A395/A395M-99(2018), 'Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures'.
      e. ASTM A536-84(2014), 'Standard Specification for Ductile Iron Castings'.
      f. ASTM A795/A795M-13, 'Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use'.
   5. National Fire Protection Association:
      a. NFPA 13: 'Standard for the Installation of Sprinkler Systems' (2019 or most recent edition adopted by AHJ).

b. NFPA 24 'Standard for the Installation of Private Fire Service Mains and Their Appurtenances' (2019 or most recent edition adopted by AHJ.
c. NFPA 25, 'Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems' (2017 or most recent edition adopted by AHJ).
d. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).

1.3 SUBMITTALS

A. Action Submittals:
1. Shop Drawings:
a. Size sprinkler system using NFPA 13 hydraulic calculation design method based on water supply evaluation performed at building site:
1) On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.
a) Grooved joint couplings and fittings shall be shown on drawings and product submittals and be specifically identified with applicable Victaulic styles or series numbers.
b. Submittal Procedure:
1) After award of Contract and before purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations to Fire Sprinkler Consultant and two (2) sets to local jurisdiction having authority for fire prevention for review. If pipe schedule method is used, submit copies of schedules in NFPA 13 used in sizing pipe.
2) After integrating Fire Sprinkler Consultant's and AHJ's comments into drawings, licensed certified fire protection engineer of record who designed fire protection system shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
3) Submit stamped documents to Owner and to AHJ for fire prevention for final approval.
4) After final approval, submit four copies of approved stamped documents to Fire Sprinkler Consultant.
5) Failure of system to meet requirements of authority having jurisdiction and/or approved stamped construction documents shall be corrected at no additional cost to Owner.

B. Informational Submittals:
1. Certificates:
a. Provide one (1) copy of completed NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping' as specified in 'Field Quality Control' in Part 3 of this specification:
2. Qualification Statement:
a. Licensed fire protection engineer or fire protection system designer:
1) Licensed for area of Project.
2) Certified by NICET to level three minimum.
3) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
b. Installer:
1) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Operations and Maintenance Data:
1) Maintenance and instructions.
a) List of system components used indicating name and model of each item.
b) Manufacturer's maintenance instructions for each component installed in Project.
c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
b. Warranty Documentation:
1) Include copies of required warranties.
c. Record Documentation:
1) Include copies of approved shop drawings.

2) Provide master index showing items included.
3) Provide name, address, and phone number of Architect, Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
4) Provide operating instructions to include:
   a) General description of fire protection system.
   b) Step by step procedure to follow for shutting down system or putting system into operation.
5) Provide signed copy of NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping'.

2. Instruction of Owner (as specified in Part 3 of this specification):
   a. Provide Owner with latest version of NFPA 25.

D. Maintenance Material Submittals:
1. Extra Stock Materials:
   a. Spare sprinkler heads in the quantity recommended by NFPA 13 selected in representative proportion to quantity used in Project and in accordance with NFPA 13 (Six (6) spare sprinkler heads minimum). Do not include dry barrel Pendent and dry barrel Sidewall sprinkler heads.
   b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Unless noted otherwise, system shall conform to:
   a. NFPA 13, 'Light & Ordinary Hazard Occupancies'.
   b. NFPA 24, 'Service Mains and Their Appurtenances, Private'.
   c. NFPA 25, 'Inspection, Testing, and Maintenance.
   d. NFPA 101, 'Life Safety Code'.
   e. Requirements of local water department and local authority having jurisdiction for fire protection.
   f. Underwriters Laboratories Publication, UL Directory B, 'Fire Protection Equipment Directory', current edition at time of Pre-Bid Meeting.
   g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.
   h. Applicable rules, regulations, laws, and ordinances.

B. Qualifications:
1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
   a. Licensed for area of Project.
   b. Minimum five (5) years experience in fire protection system installations.
   c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
   d. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
   e. Make complete inspection of installation.
   f. Provide corrected record drawings to Owner with letter of acceptance.
   g. Certify that installation is in accordance with Contract Documents.
   h. Upon request, submit documentation.
2. Installer:
   a. Licensed for area of Project.
   b. Minimum five (5) years experience in fire protection system installations.
   c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
   d. Upon request, submit documentation.

C. Components:
1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.
   a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.
   b. Ductile iron fittings of foreign manufacture are acceptable.
2. Pipe:
   a. Schedule 40 Welded Steel:
      1) Exterior, Above Ground: Schedule 40 hot-dip galvanized welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
      2) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
      3) Connections:
         a) 2 inches (50 mm) And Smaller: Screwed, flanged, or roll grooved coupling system.
         b) 2-1/2 inches (64 mm) And Larger: Flanged or roll grooved coupling system.
3. Fittings:
   a. Usage:
      1) 2 inches (50 mm) And Smaller: Welded, screwed, flanged, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.
      2) 2-1/2 inches (64 mm) And Larger: Welded, flanged, or roll grooved coupling system.
   b. Types And Quality:
      1) Screwed:
         a) Cast iron meeting requirements of ANSI B16.4 or ductile iron meeting requirements of ANSI B16.3 and ASTM A536, Grade 65-45-12.
         b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.
         c) Do not extend pipe into fittings to reduce waterway.
         d) Ream pipe after cutting to remove burrs and fins.
      2) Flanged: Steel meeting requirements of ANSI B16.5.
      3) Welded:
         a) Carbon steel meeting requirements of ASTM A234/A234M.
         b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with AWS B2.1, level AR3.
      4) Roll Grooved Pipe Coupling System:
         a) Ductile iron meeting requirements of ASTM A395/A395M and ASTM A536, and UL listed.
         b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.

   c. Use of saddle or hole cut type mechanical tees is **NOT APPROVED**.
4. Valves:
   a. Butterfly Valves:
      1) Design Criteria:
         a) UL / CASA approved.
         b) Indicating type.
   b. Gate Valves:
      1) Design Criteria:
         a) UL / CASA approved.
         b) Outside Screw and Yoke Type (O.S.&Y).
         c) Class 150 psi.
   c. Ball Valves:
      1) Design Criteria:
         a) UL / CASA approved.
         b) Valve tamper switch.
   d. Swing Check Valves:
      1) 1/2 to 3 inch (13 to 75 mm) horizontal check.
         a) Design Criteria:
            (1) Regrinding type.
            (2) Renewable disk.
            (3) Bronze Class 125 with threaded ends.
      2) 2 to 4 inch (50 to 100 mm) Horizontal check:
         a) Design Criteria:

(1) Grooved ends.
(2) Ductile iron body.
(3) Rated 300 psi (2.07 MPa).

3) 3 to 12 inch (76 to 300 mm) Horizontal check:
a) Design Criteria:
(1) Bolted bonnet.
(2) Raised face flanges.
(3) Bronze mounted with ductile iron body.
(4) 125 lb (56.7 kg) Class A.

e. Wafer Type Check Valves:
1) Design Criteria:
a) 4 to 8 inch (100 to 300 mm) cast iron body.
b) 175 psi (1.21 MPa) minimum working pressure.
c) Rubber Seat.

f. Grooved-End Check Valves:
1) Design Criteria:
a) UL / CASA listed and approved to 250 psi (1.72 MPa) maximum operating pressure.
b) 2-1/2 to 12 inch (64 to 300 mm) ductile iron body.
c) Disc And Seat:
(1) 2-1/2 And 3 Inch (64 to 75 mm): Aluminum bronze disc with mounted elastomer seal and PPS (polyphenylene sulfide) coated seat.
(2) 4 Inch (100 mm) And Larger: Elastomer encapsulated ductile iron disc with welded in nickel seat.
(3) Viking: Model VK462.

g. Alarm Check Valves:

h. Backflow Preventer: Make and model shown on Drawings or as required by local codes.

i. Retard Chamber:
1) Design Criteria:
a) Self-draining.

j. Inspector's Test Valve:
1) Design Criteria:
a) Bronze body with threaded or grooved ends.
b) Combination sight glass / orifice.

5. Sprinkler Heads:
a. Concealed Pendant:
1) Design Criteria:
a) Adjustable cover.
b) UL / CASA listed and approved.
c) Coordinate concealed cover finish with Fire Sprinkler Consultant. 01 6200.
d) Dry Pendant:
(1) Flat Profile:
(a) Tyco (Grinnell): DS-C.
(b) Victaulic: V3618.
(2) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

b. Horizontal Sidewall Sprinkler:
1) Design Criteria:
a) UL / CASA listed and approved.
b) Recess adjustable.
c) Where guards are required, use chrome plated sprinkler guards that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
2) Type One Acceptable Products:
a) Wet System:
(1) Reliable: F1FR.
(2) Tyco (Grinnell): Model TY-FRB.
(3) Victualic: Model V2710.
(4) Viking: VK305.

(5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

b) Dry System:
(1) Reliable: F3QR.
(2) Tyco (Grinnell): DS-1.
(3) Victualic: Model V3610.
(4) Viking: VK162.
(5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

c. Attic Sprinklers, Upright:
1) Design Criteria:
a) UL / CASA listed and approved.
b) Approved for use in roof structures, combustible and non-combustible, with ceiling below.

d. Pendant Sprinklers:
1) Design Criteria:
a) UL / CASA listed and approved.
b) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
2) Type One Acceptable Products:
a) Reliable: F1FR.
b) Tyco: TY-FRB.
c) Victaulic: Model V2704.
d) Viking: VK302.
e) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

e. Upright Sprinklers:
1) Design Criteria:
a) UL / CASA listed and approved.
2) Type One Acceptable Products:
a) Reliable: F1FR.
b) Tyco: TY-FRB.
c) Victaulic: Models V2704.
d) Viking: VK300.
e) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

f. Dry Pendant Sprinkler Heads In Cooler And Freezer:
1) Design Criteria:
a) UL / CASA listed and approved.
b) Coordinate semi-recessed escutcheon cover finish with Fire Sprinkler Consultant.
c) Flush Ceiling profile.
d) Adjustable cover.

6. Water Flow Alarm:
a. Electric Flow Alarm:
1) Design Criteria:
a) UL / CASA listed and approved.
b) System Sensor: Bell, SSV-120, 120VAC.
c) System Sensor: Horn Strobe, P2RHK-120, 120 VAC.

b. Mechanical Flow Alarm: Water Gong.
1) Design Criteria:
a) UL / CASA listed and approved.

7. Pressure Gauges:
a. Mechanical Water Pressure Gauges:
1) Design Criteria:
a) UL / CASA listed and approved.
b) 3-1/2 inch (89 mm) diameter dial.
c) 0 to 300 psi (0 to 2.07 MPa) in 5 psi (34.5 kPA) increments.

8. Waterflow Detectors:
a. Electrical Water Flow Switch:

1) Design Criteria:
a) UL / CASA listed.
b) Switch activates with flow of 10 gpm (37.85 lpm) or more.
c) Two single pole double throw switches.
d) Automatic reset.

9. Tamper Switch
a. Weather and Tamper Resistant Switch.
1) Design Criteria:
a) UL / CASA listed.
b) Mount to monitor valve and not interfere with operation.
c) Shall operate in horizontal and vertical position.

10. Automatic Drain Device:
a. Design Criteria:
1) Straight Design, 3/4 inch (19 mm).

11. Fire Department Connection:
a. Two-way Inlet with single clapper:
1) Class One Quality Standards: See Section 01 6200:
a) Round 'AUTO SPKR' identification plate, red enamel finish aluminum plate:
(1) Croker: Fig 6766.
(2) Potter-Roemer Fig. 5966.
.

12. Indicating Post Valve:
a. Design Criteria:
1) As specified in Section 33 1119: 'Fire Suppression Water Distribution Piping'.
2) Prefer exposed parts non-brass, for theft protection.
3) Supervisory switch.

1.5 ACCESSORIES

A. Manufacturers:
1. Manufacturer Contact List:
a. Anvil International, Portsmouth, NH www.anvilintl.com.
b. Eaton, Highland, IL www.cooperbline.com.
c. Unistrut Construction, Itasca, IL www.unistrutconstruction.com.

B. Concrete Inserts:
1. Individual:
a. Class Two Quality Standard: See Section 01 6200.
1) Anvil Fig 282. Suitable for special nuts size 3/8 inch (9.5 mm) through 7/8 inch (22 mm), with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
2. Continuous Inserts:
a. Class Two Quality Standard: See Section 01 6200.
1) Unistrut Standard Duty P-3249 through P-3270.

C. Hangers, Rods, And Clamps:
1. Design Criteria:
a. Galvanized, unless specified otherwise, and UL/CASA listed and labeled for service intended.
b. Hanger supports for sprinkler piping to conformance with NFPA 13.
2. Class One Quality Standard:
a. Hangers and accessories shall be Anvil numbers specified or equals by B-Line by Eaton.
b. Pipe Ring Hangers: Equal to Anvil Fig 69.
c. Riser Clamps: Equal to Anvil Fig. 261.

D. Posted System Diagram:
1. Provide single floor plan diagram showing wet pipe system elements.
2. Include following information on diagram sheet:
a. Step by step shut down procedure.

b. Step by step system drainage procedure.
c. Step by step start-up procedure.
d. Step by step procedure for protection of system from freezing.
e. Step by step procedure to follow in deactivating system for maintenance.

3. Laminate diagram with plastic and mat or frame suitable for hanging near riser.

E. Steel Deck Bracket:
1. Class Two Quality Standard: See Section 01 6200.
a. Unistrut P1000 with clamp nut, minimum 6 inch (150 mm) length.

PART 2 - EXECUTION

2.1 INSTALLERS

A. Acceptable Installers. See Section 01 4301:
1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

2.2 EXAMINATION

A. Drawings:
1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit. Install system so it drains.
2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These Drawings take precedence over Fire Protection Drawings.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions and to enable system to drain.

2.3 INSTALLATION

A. Connect system to flange provided under Section 33 1119: 'Fire Suppression Utility Water Distribution Piping'. After installation of riser, fill annular space between pipe and slab with flexible mastic.

B. Install sprinkler systems in accordance with requirements of latest edition of NFPA 13 and as specified below:
1. Provide maintenance access to equipment.
2. Conceal sprinkler lines installed in occupied areas. In Mezzanine areas, route pipe to side or underneath Mezzanine walkway. Do not impede egress from Mezzanine or Roof.
3. Install to enable drainage of system. Drain trapped piping in accordance with NFPA 13.
a. Install main drain from riser.
4. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.
5. Do not use dropped, damaged, or used sprinkler heads.
6. Install tamper switches and flow detectors where located by Fire Sprinkler Consultant.
7. Install automatic ball drip device in lowest point of piping to fire department connection and drain to floor drain or to exterior of building.
8. Brace and support system to meet seismic zone requirements for building site.

C. Flush system at full design flow rate for minimum five minutes. Route water to outside of building. Protect landscaping and other exterior elements from damage during flow tests.

2.4 FIELD QUALITY CONTROL

A. Field Tests:
   1. Pressure Test:
      a. Hydrostatically test system to 200 psi (1.38 MPa) minimum for two (2) hours as required by 'Contractor's Material And Testing certificate for Aboveground Piping':
         1) NFPA 13 (2010), Figure 24.1.
         2) NFPA 13 (2013), Figure 25.1.
         3) NFPA 13 (2016), Figure 25.1.
   2. Water Flow Test:
      a. Test to determine static and residual pressures and corresponding flow rate at point of connection to utility water main.
      b. Adjust water flow test data for seasonal fluctuations and future growth as recommended by Water Utility and AHJ.
      c. At point of connection to utility water main, combine inside and outside hose stream allowances.
   3. Check piping in relation to building's thermal envelope to be certain piping is within insulation envelope and protected from freezing temperatures. Report unsatisfactory conditions to Fire Sprinkler Consultant.
   4. Tests shall be witnessed by Fire Sprinkler Consultant and representative of local jurisdiction over fire prevention.

2.5 CLOSE-OUT ACTIVITIES

A. Instruction of Owner:
   1. Instruction Sessions:
      a. Instruct Owner's personnel in operation and maintenance of system utilizing 'Operation And Maintenance Manual' when so doing. Minimum instruction period shall be four (4) hours.
      b. Instruction sessions shall occur after Substantial Completion inspection when system is properly working and before final payment is made.
      c. Provide Owner with latest version of NFPA 25.

B. Training:
   1. Installer required to provide FM Training from latest version of NFPA 25 with checklist and brief explanation of following inspections:
      a. Weekly Inspection.
      b. Monthly Inspection.
      c. Quarterly Inspection.
      d. Semi-Annual Inspection.
      e. Annual Inspection.

END OF SECTION

SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 22 Sections. Also refer to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

A. CCR California Code of Regulation

B. CBC California Building Code

C. CFC California Fire Code

D. CEC California Electric Code

E. CMC California Mechanical Code

F. CPC California Plumbing Code

G. California Title 24 - Building Energy Efficiency Standards

H. SCAQMD South Coast Air Quality Management District

1.3 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.

C. Separate contracts will be awarded for the following work:

D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

E. Separate contracts will be awarded for the following work. The division of work listed below is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

F. Scope of Work:

1. Plumbing Work shall include, but is not necessarily limited to:

   a. Furnish and install all items listed in the Plumbing Material List.
   b. Furnish and install a new domestic water service to the building.
   c. Furnish and install water meter and domestic water backflow preventer as required by Code.
   d. Furnish and install a complete domestic water piping system including cold, hot, and hot water circulating piping within the building. Insulate all piping as specified.
   e. Furnish and install water heaters.
   f. Furnish and install a new fire protection service to the building including backflow preventer as required by Code.
   g. Furnish and install complete storm water drainage system.
   h.
   i. Furnish and install condensate drain piping from plumbing related equipment such as ice machines.
   j. Furnish and install complete sanitary sewer and vent system.
   k. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 22 05 50.
   l. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
   m. Complete all applicable tests, certifications, forms, and matrices.

2. Heating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
3. Air Conditioning and Ventilating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
4. Temperature Control Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
5. Fire Protection Work: Refer to Section 21 05 00 "Basic Fire Suppression Requirements".
6. Testing, Adjusting, and Balancing Work: Refer to Section 23 05 00 "Basic HVAC Requirements".

1.4 WORK SEQUENCE

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:

   a. Plumbing Contractor.
   b. Heating Contractor.
   c. Air Conditioning and Ventilating Contractor.
   d. Temperature Control Contractor.
   e. Fire Protection Contractor.
   f. Testing, Adjusting, and Balancing Contractor.

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.

   a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.

6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Electrical Code Article 725.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:

    a. Light fixtures.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical busduct.
    d. Sheet metal.
    e. Electrical cable trays, including access space.
    f. Sprinkler piping and other piping.
    g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:

    a. Condensing Units.
    b. Makeup Air Units.
    c. Package Air Handling Units.
    d. Packaged Rooftop Units.

2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.

3. Shall verify all existing equipment sizes and capacities where units are to be modified, moved or replaced. Contractor shall notify Architect/Engineer of any discrepancies prior to ordering new units or replacement parts, including replacements of equipment motors.
4. Temperature Control Subcontractor's Responsibility:

    a. Wiring of all devices needed to make the Temperature Control System functional.
    b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor.
    c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:

1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.
5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
d. Maintenance clearances and code-required dedicated space shall be included.
e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1 '-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1 '-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the Architect/Engineer for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the Architect/Engineer and Owner's Representative. The Architect/Engineer will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.

6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The Architect/Engineer reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the Architect/Engineer.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the Architect/Engineer at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the Architect/Engineer and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.7 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the <County of San Bernardino> Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State and local Codes.
3. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.
4. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
5. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
6. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
7. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
8. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriters' Laboratories, Inc. and approved by FM Global.

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.

3. Make application for and pay for service connections, such as sewer and water..
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:

1. The drawings for the plumbing work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.

    a. Any item listed as furnished shall also be installed, unless otherwise noted.
    b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.

5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.8 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals List:

Referenced Specification Section	Submittal Item
22 05 00	Owner Training Agenda
22 05 03	Fire Seal Systems
22 05 13	Motors
22 05 16	Expansion Compensation
22 05 29	Hangers and Supports
22 05 29	Prefabricated Curbs
22 05 50	Seismic Restraint Systems
22 05 53	Plumbing Identification
22 07 19	Plumbing Pipe Insulation
22 09 00	Instrumentation
22 10 00	Plumbing Piping Systems and Valves
22 10 30	Plumbing Specialties
22 30 00	Plumbing Equipment
22 40 00	Plumbing Fixtures

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

a. Date
b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

    a. Date
    b. Project title and number
    c. Architect/Engineer
    d. Contractor and subcontractors' names and addresses
    e. Supplier and manufacturer's names and addresses
    f. Division of work (e.g., plumbing, heating, ventilating, etc.)
    g. Description of item submitted (using project nomenclature) and relevant specification number
    h. Notations of deviations from the contract documents
    i. Other pertinent data
    j. Provide space for Contractor's review stamps

3. Composition:

    a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
    b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
    c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.

6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
7) Dimensions and service clearances are suitable for the intended location.
8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
b. The Contractor shall clearly indicate the size, finish, material, etc.
c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.

15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 22 XX XX.description.YYYYMMDD
    b. Transmittal file name: 22 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.9 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.

2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Excavation and backfill for underground piping systems inside the building.
    b. Underground piping systems inside the building (sanitary, storm, etc.) listed separately. Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
    c. Each aboveground piping system (sanitary, storm, domestic water, etc.). Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
    d. Pipe insulation with separate material and labor line items for each piping system listed above.
    e. Each piece of equipment requiring shop drawings (e.g., backflow preventer, water heater, water softener, etc.) using the project nomenclature (BFP-1, WH-1, WS-1, etc.).
    f. Each plumbing fixture (e.g., WC, lavatory, sink, etc.). Multiple units of the same type can be listed together, provided quantities are also listed so unit costs can be determined.
    g. Site utilities (5' beyond building)
    h. Seismic design
    i. Water balancing
    j. Commissioning
    k. Record drawings
    l. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.10 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.11 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Fire Seal Systems
2. Seismic Restraints and Equipment Bracing

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.12 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.13 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.14 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.15 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.16 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the first manufacturer is the basis for job design and establishes the quality.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractor's part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

1.17 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and 22 08 00 and provide all services as described in the Commissioning Plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. Utilities Bedding: Lay underground utilities on minimum of 6" sand bedding or CA6 crushed stone. Compact bedding under utilities smooth, with no sharp edges protruding, to protect the utilities from puncture. Shape bedding to provide continuous support for bells, joints, and barrels of utilities and for joints and fittings.
2. Envelope Around Utilities to 6" Above Utilities: Place sand or CA6 crushed stone to a height of 6" over utilities in 6" layers. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
3. Backfill From 6" Above Utilities to Earthen Grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep.
4. Backfill From 6" Above Utilities to Below Slabs or Paved Area: Where the sand or CA6 crushed stone fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
5. Backfill Materials:

    a. Sand, CA6: Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
    b. Native Soil: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Native soils shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
    c. Flowable Fill: Cementitious, self-leveling, self-compacting slurry as defined by the ACI with compressive strength of 50-100psi at 28 days; consisting of a mixture of fine aggregate or filler, water and cementitious materials. Filler material consist of sand, fly ash, spent foundry sand, quarry fines, baghouse dust. Cementitious materials consist of Portland cement, pozzolanic materials, and self-cementing materials. Flowable fill may be placed in a pour instead of 6" layers noted above.

6. Water shall not be permitted to rise in unbackfilled trenches.
7. Dispose of excess excavated earth as directed.
8. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
9. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

F. Surface Restoration:

1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

a. Pipe insulation is installed and fully sealed.
b. Pipe wall penetrations are sealed.
c. Pipe identification and valve tags are installed.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.

2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

C. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Start-up reports on all equipment requiring a factory installation inspection or start-up.
5. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div22.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div22.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.
16. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The instructions shall include:

1. Explanation of all system flow diagrams.
2. Maintenance of equipment.
3. Start-up procedures for all major equipment.
4. Explanation of seasonal system changes.
5. Explanation of Owner’s Responsibilities to operate, maintain, and flush domestic water system (i.e., ASHRAE Standard 188).

E. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.

F. Minimum hours of instruction for each item shall be:

1. Domestic Hot Water System - 2 hours
2. All Domestic Water Systems operation, maintenance and flushing of all fixtures and dead legs - 2 hours

G. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

H. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The plumbing systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. Contractor shall adjust the plumbing systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

D. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraphs supplement Division 1 requirements.

B. Maintain at the job site a separate and complete set of plumbing drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations devices, requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.

D. Before completion of the project, a set of reproducible plumbing drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

1. All piping in mechanical room
2. Piping exposed in occupied areas

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:

1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.
3. Color of paint shall be as follows:

    a. All piping in mechanical room:

        1) Domestic Cold Water: Blue pipe/white letters
        2) Domestic Hot Water: Red pipe/white letters
        3) Sanitary Waste: Green pipe/black letters

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.

D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:

1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.

3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

   a. Minimizing the amount of dust generated.
   b. Reducing solvent fumes and VOC emissions.
   c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
   d. Protect stored on-site and installed absorptive materials from moisture damage.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

3.13 CONSTRUCTION WASTE MANAGEMENT

A. This Contractor shall comply with all construction and demolition waste disposal and recycling requirements.

1. This Contractor shall coordinate with the General Contractor to develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.
2. The Contractor shall track waste disposal and recycling efforts throughout the construction process for all materials associated with this Contractor's scope of work. The Contractor shall provide this information to the General Contractor so that it can be incorporated with similar information from all other contractors for the project.

a. Calculations for waste and recycled material can be done by weight or volume, but they must be consistent throughout the project. The Contractor shall coordinate with the General Contractor to establish the preferred calculation method and report the results accordingly.
b. Excavated soil and land-clearing debris do not count towards the waste disposal or recycled material.

3.14 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

1. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. All plumbing fixtures installed and caulked.
4. Pipe insulation complete, pipes labeled and valves tagged.
5. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION

SECTION 22 05 03 - THROUGH PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Through-Penetration Firestopping.

1.2 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.3 REFERENCES

A. UL 263 - Fire Tests of Building Construction and Materials

B. UL 723 - Surface Burning Characteristics of Building Materials

C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops

D. UL 2079 - Tests for Fire Resistance of Building Joint Systems

E. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)

F. Intertek / Warnock Hersey - Directory of Listed Products

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops

I. The Building Officials and Code Administrators National Building Code

J. NFPA 5000 - Building Construction Safety Code

K. CBC California Building Code

1.4 SUBMITTALS

A. Submit under provisions of Section 22 05 00.

B. Submit Firestopping Installers Certification for all installers on the project.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
4. F ratings for each firestop system.

D. Maintain a notebook on the job site at all times that contains copies of approved submittals for all through penetration firestopping to be installed. Notebook shall be made available to the Authority Having Jurisdiction at their request and turned over to the Owner at the end of construction as part of the O&M Manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.

B. Install material prior to expiration of product shelf life.

1.6 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

2. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 5.0 cfm/sq. ft at both ambient temperature and 400°F for smoke barriers.

C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

F. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:

1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

1.7 MEETINGS

A. Pre-installation meeting: A pre-installation meeting shall be scheduled and shall include the General Contractor, all Subcontractors associated with the installation of systems penetrating fire barriers, Firestopping Manufacturer's Representative, and the Owner.

1. Review foreseeable methods related to firestopping work.
2. Tour representative areas where firestopping is to be installed; inspect and discuss each type of condition and each type of substrate that will be encountered, and preparation to be performed by other trades.

1.8 WARRANTY

A. Provide one year warranty on parts and labor.

B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.

1. 3M; Fire Protection Products Division.
2. Hilti, Inc.
3. Dow Corning Corp.

2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.

B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.

C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.

D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture resistant.

E. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.

F. Provide firestopping systems allowing continuous insulation for all insulated pipes.

G. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:

1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated:

a. F Rating = Floor/Wall Rating
b. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999

Penetrating Item	UL System No.
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

2. Non-Combustible Framed Walls - 1 or 2 Hour Rated:

   a. F Rating = Floor/Wall Rating
   b. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated:

   a. F Rating = Wall/Floor Rating
   b. L Rating = Penetrations in Smoke Barriers

Penetrating Item	UL System No.
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

H. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.

I. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.

B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.

C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.

D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.2 INSTALLATION

A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.

B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.

C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

3.3 CLEANING AND PROTECTING

A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.4 IDENTIFICATION

A. Provide and install labels adjacent to each firestopping location. Label shall be provided by the firestop system supplier and contain the following information in a contrasting color:

1. The words "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Firestop System Supplier; UL or listed by Intertek / Warnock Hersey system number; date installed; contractor name and phone number; manufacturer's representative name, address, and phone number.

3.5 INSPECTION

A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.

B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.

C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.

D. The contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the contractor and witnessed by the engineer and manufacturer's factory representative. The engineer shall have sole discretion of which firestop system installations will be reviewed. The contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the engineer's discretion and the contractor's expense.

END OF SECTION

SECTION 22 05 13 - MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Phase and Three Phase Electric Motors.

1.2 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.

E. ANSI/NEMA MG 1 - Motors and Generators.

F. ANSI/NFPA 70 - National Electrical Code.

G. Energy Independence and Act of 2007.

1.3 SUBMITTALS

A. Submit shop drawings for all three phase motors.

B. Submit motor data with equipment when motor is installed by the manufacturer at the factory.

C. Submit for all motors as required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's recommendations for equipment and motor.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data including assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of commercial and industrial motors and accessories, with a minimum of three years documented manufacturing experience.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Refer to the drawings for required electrical characteristics. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. Design motors for continuous operation in 40ºC environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

C. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, insulation class.

D. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

E. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open drip-proof or totally enclosed fan-cooled type.

F. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel cage type, NEMA Design Code B (low current in-rush, normal starting torque), open drip-proof or totally enclosed fan-cooled type.

G. Each contractor shall set all motors furnished by him.

H. All motors shall have a minimum service factor of 1.15.

I. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.

J. Bearings shall be sealed type for 10 HP and smaller motors. Bearings shall be regreasable type for larger motors.

K. Aluminum end housings are not permitted on motors 15 HP or larger.

L. Motor Driven Equipment:

1. No equipment shall be selected or operate above 90% of its motor nameplate rating. Motor size may not be increased to compensate for equipment with efficiency lower than that specified.
2. If a larger motor than specified is required on equipment, the contractor supplying the equipment is responsible for all additional costs due to larger starters, wiring, etc.

M. Provide all belted motors with a means of moving and securing the motor to tighten belts. Motors over 2 HP shall have screw type tension adjustment. Motors over 40 HP shall have dual screw adjusters. Slide bases shall conform to NEMA standards.

N. Motors for pumps 1/12 HP or greater and less than 1 HP shall be electronically-commutated motors or shall have a minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431. These motors shall also have the means to adjust motor speed for either balancing or remote control.

2.2 ELECTRICALLY COMMUTATED MOTORS (ECM)

A. Motor shall be variable speed, constant torque, brushless DC motor for direct-drive applications. Electronics shall be encapsulated for moisture protection and shall integral surge protection. Motor shall be pre-wired for specific voltage and phase.

B. Motor frame shall be NEMA 48; UL recognized components shall be provided for the motor construction.

C. All EC motors shall be a minimum of 85% efficient at all speeds.

D. Motors shall be permanently lubricated; utilize ball bearings to match with the connected driven equipment.

E. Provide motor with onboard motor control module. Motor speed shall be limited to provide electronic over current protection. Starter shall provide soft start to reduce inrush current and shall be controllable from 20% to 100% of full rated speed.

F. Operational mode shall be as scheduled and shall be one of the following:

1. Constant Flow
2. Constant Temperature
3. Constant Pressure

	Full-Load Efficiencies %					
	Open Drip-Proof			Totally Enclosed Fan Cooled		
HP	1200 rpm	1800 rpm	3600 rpm	1200 rpm	1800 rpm	3600 rpm
1.0	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2.0	87.5	86.5	85.5	88.5	86.5	85.5
3.0	88.5	89.5	85.5	89.5	89.5	86.5
5.0	89.5	89.5	86.5	89.5	89.5	88.5

2.3 MOTORS FOR WET OR CORROSIVE DUTY

A. Where noted for wet and/or corrosive duty, motors shall be designed for severe duty with cast-iron frame, epoxy finish, stainless steel nameplate, polymer shaft seal, corrosion resistant fasteners and fan, moisture resistant windings, and non-wicking leads.

2.4 SHEAVES

A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters and maximum overhangs. Locate motors to minimize overhang.

B. When replacing sheaves, use sheaves of at least the originally supplied sizes.

C. Contractor responsible for motor shall also be responsible for replacement sheaves. Coordinate with testing and balancing of the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

B. For flexible coupled drive motors, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Align shafts to manufacturer's requirements or within 0.002 inch per inch diameter of coupling hub.

C. For belt drive motors, mount sheaves on the appropriate shafts per manufacturer's instructions. Use a straight edge to check alignment of the sheaves. Reposition sheaves as necessary so the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so the belt(s) can be added, and tighten the base so the belt tension is in accordance with the drive manufacturer's recommendations. Frequently check belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

END OF SECTION

SECTION 22 05 16 - PLUMBING EXPANSION COMPENSATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Expansion Joints and Compensators.

B. Pipe Loops, Offsets, and Swing Joints.

1.2 REFERENCES

A. Conform to Standards of Expansion Joint Manufacturer's Association.

1.3 SUBMITTALS

A. Expansion joint shop drawings shall include maximum motion.

1.4 DESIGN CRITERIA

A. Unless noted otherwise, base expansion calculations on 50°F installation temperature to 140°F for domestic hot water, plus 30% safety factor.

PART 2 - PRODUCTS

2.1 EXPANSION JOINTS

A. Type EJ-4:

1. Assembly consisting of two flexible connectors, two stainless steel flexible connectors, two 90° elbows, and a 180° return pipe. Unit shall be in the form of a pipe loop.
2. Connectors shall have corrugated stainless hose bodies with stainless steel braided casings.
3. Connectors shall be rated for 150 psi working pressure at 70°F and 100 psi at 800°F.
4. Sizes 2" and smaller shall have steel threaded connections.
5. Sizes 2-1/2" and larger shall have 150 lb. steel flanges.
6. Connectors shall be suitable for 1/2" permanent misalignment.

a. Manufacturer:

1) Metraflex Type ML

B. Type EJ-5:

1. Plastic storm, waste and vent expansion joint. Pipe within a pipe arrangement with 6” (+/-3”) total travel.

2. Connectors shall have EPDM (PVC pipe) or FKM (CPVC) O-ring seal used to seal telescoping sections.
3. Solvent weld or fused connections to match piping material specification.
4. Rated for up to 140°F (PVC pipe) or 180°F (CPVC).

    a. Manufacturer:

        1) Flexicraft P or CP

C. Concrete Thrust Blocks - Rods and Clamps:

1. Bends, offsets, tees, crosses, and dead ends, including flange and spigot pieces, shall be suitably rodded or clamped and blocked with concrete thrust blocks.
2. Rods shall be all thread type, galvanized steel conforming to ANSI B1.1, Class 2A FIT, USS National Coarse Thread, tensile strength 55/77 ksi, yield strength 36 ksi minimum.
3. Rods and clamps shall receive one field coat of asphaltum after installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Accomplish structural work and provide equipment required to control expansion and contraction of piping; including loops, offsets, swing joints, and expansion joints where required.

B. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so all movement occurs along axis of pipe only.

C. Each expansion joint shall have either one anchor or two alignment guides on each side of it. Guides shall be located within 4 and 14 pipe diameters of the expansion joint or as recommended by the joint manufacturer.

D. Preset all expansion joints to allow for expected expansion from installation temperature to operating temperature.

END OF SECTION

SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Sleeves and Seals.

D. Flashing and Sealing of Equipment and Pipe Stacks.

E. Cutting of Openings.

F. Escutcheon Plates and Trim.

1.2 REFERENCES

A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

B. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

C. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices

D. MSS SP-127 - Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 22 05 00. Include plastic pipe manufacturers' support spacing requirements.

1.4 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINTS

A. Refer to Section 22 05 50 for additional requirements for seismic restraints.

2.2 HANGER RODS

A. Hanger rods for single rod hangers shall conform to the following:

	Hanger Rod Diameter	
Pipe Size	Column #1	Column #2
2-1/2" and smaller	3/8"	3/8"
3" through 3-5/8"	3/8"	3/8"
4" and 5"	1/2"	1/2"
6"	3/4"	5/8"
8" through 12"	7/8"	3/4"

Column #1: Steel, cast iron, and glass pipe.
Column #2: Copper and plastic pipe.

B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.

C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

2.3 PIPE AND STRUCTURAL SUPPORTS

A. General:

1. Pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS SP-58, 69, 89, and 127 (where applicable).
2. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Refer to insulation specifications for materials and additional information.

3. Copper piping located in an exposed area, including indirect waste piping in janitor's closets, shall use split ring standoff hangers for copper tubing. Support shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp. Use electro-galvanized or more corrosion resistant and threaded rod for floor applications. Use anchors applicable to the wall type with corrosion resistant threaded rod for wall applications.

a. Products:

1) Eaton Fig. 3198HCT
2) Anvil Fig. CT138R

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, unless otherwise noted by applicable codes, but never at intervals over 15 feet Support vertical pipes with riser clamps installed below hubs, couplings, or lugs. Provide sufficient flexibility to accommodate expansion and contraction to avoid compromising fire barrier penetrations or stressing piping at fixed takeoff locations.

    a. Products:

        1) Eaton Fig B3373 Series
        2) nVent 510 Series
        3) Anvil Fig. 90

2. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs. Wall supports shall be coordinated with the Structural Engineer.
3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

C. Hangers and Clamps:

1. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
2. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp within their temperature limits of -65°F to +275°F.
3. Vertical cold pipe drops and rough-ins to fixtures shall be supported by insulated pipe clamps to prevent thermal bridging and condensation.
4. On all insulated piping, provide a semi-cylindrical metallic shield and vapor barrier jacket.

5. Unless otherwise indicated, hangers shall be as follows:

    a. Clevis Type: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches & Smaller

        1) Products: Bare Steel Plastic or Insulated Pipe:

            a) Anvil Fig. 260
            b) Eaton Fig. 3100

        2) Products: Bare Copper Pipe Felt or PVC Coated:

            a) Eaton Fig. B3104F or B3100CTC

b) Anvil Fig. CT65

b. Adjustable Swivel Ring Type: Bare Metal Pipe - 4 inches and Smaller

1) Products: Bare Steel Pipe:

a) Anvil Fig. 69
b) Eaton Fig. B3170NF

2) Products: Bare Copper Pipe:

a) Eaton Fig. B3170CTC
b) nVent 102A0 Series

6. Support may be fabricated from U-channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.

a. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
b. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip galvanized finish applied after fabrication.

7. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

a. Clamp Type: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches and smaller

1) Clamps in direct contact with copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp.
2) Pipes subject to expansion and contraction shall have clamps oversized to allow limited pipe movement.
3) Products: Bare Steel, Plastic or Insulated Pipe:

a) Unistrut Fig. P1100 or P2500
b) Eaton Fig. B2000 or B2400
c) Anvil Fig. AS1200

4) Products: Bare Copper Pipe:

a) Eaton Fig. BVT
b) nVent CADDY Cushion Clamp

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:

a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.):

1) Products:

a) Anvil Fig. 86
b) Eaton Fig. B3033/B3034
c) nVent Model 300 & 310

b. Concentrically Loaded Open Web Joist Hangers (for use with bar joists):

1) Products:

a) MCL. M1, M2 or M3

c. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-05. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.

d. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

e. Steel Structure Welding:

1) Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and protecting walls and ceilings from smoke damage.

f. Wood Anchors: Tension wood rod hanger for suspending 3/8" threaded rod. Zinc plated carbon steel.

1) Minimum allowable tension loads for Douglass Fir/Southern Pine:

a) 3/8" diameter rod; 2-1/2" shank: 600 lb/590 lb.
b) Load values are based on full shank penetration into wood member. Minimum edge distance 3/4". Minimum end distance 3-1/4".

2) Limitations:

a) Truss: Do not hang from wood trusses without truss manufacturer or Structural Engineer’s approval.
b) Sheetrock/Gypsum Ceiling: When drilling through non-wood materials (e.g., sheet rock, gypsum, etc.), increase shank length by depth of non-wood materials.

c) Plywood Flooring/Roofing: Do not hang from plywood floor or roofing.
d) Spacing: Refer to wood structure spacing of hangers.

3) Products:

a) Simpson RWV
b) DeWALT
c) ITI Sammys GT25

2.4 FOUNDATIONS, BASES, AND SUPPORTS

A. Basic Requirements:

1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.
2. All concrete foundations, bases and supports, shall be reinforced. All steel bases and supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.

B. Concrete Bases (Housekeeping Pads):

1. Refer to Section 22 05 50 for additional requirements for concrete bases in seismic applications.
2. Unless shown otherwise on the drawings, concrete bases shall be nominal 4 inches thick and shall extend 3 inches on all sides of the equipment (6 inches larger than factory base), except where pad extension would interfere with working space at equipment control panels and electrical panels.
3. Where a base is less than 12 inches from a wall, extend the base to the wall to prevent a "dirt-trap".
4. Concrete materials and workmanship required for the Contractor's work shall be provided by the Contractor. Materials and workmanship shall conform to the applicable standards of the Portland Cement Association. Reinforce with 6"x6", W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at 28 days.
5. Equipment requiring bases is as follows:

a. Expansion Tank
b. Day Tank
c. Heat Exchanger
d. Pump
e. Tank
f. Water Heater
g. Water Softener

C. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.

2. Hang heavy equipment from concrete floors or ceilings with Architect/Engineer-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.

D. Grout:

1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

2.5 OPENINGS IN FLOORS, WALLS AND CEILINGS

A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.

B. Coordinate all openings with other Contractors.

C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.

D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.

E. Do not cut structural members without written approval of the Architect or Structural Engineer.

F. Exposed Housing Penetrations: Seal pipes with surface temperature below 150°F, penetrating housings with conical stepped, white silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite.

2.6 ROOF PENETRATIONS

A. Roof Curb Enclosure: Provide weatherproof roof curb and enclosure for pipe penetrations. Refer to drawings for details.

B. Conical Pipe Boot: Seal pipes with surface temperature below 150°F penetrating single-ply roofs with conical stepped, UV-resistant silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite. Color: White shall match roofing membrane.

C. Break insulation only at the clamp for pipes between 60°F and 150°F. Seal outdoor insulation edges watertight.

2.7 SLEEVES AND LINTELS

A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.

B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.

C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.

D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.

E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.

F. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.

G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.

H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (e.g., foam, rubber, asphalt-coated fiber, bituminous-impregnated felt, or cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.

I. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

J. Wall Seals ("Link-Seals"):

1. Where shown on the drawings, pipes passing through walls, ceilings, or floors shall have their annular space (sleeve or drilled hole - not tapered hole made with knockout plug) sealed by properly sized sealing elements consisting of a synthetic rubber material compounded to resist aging, ozone, sunlight, water and chemical action.
2. Sleeves, if used, shall be standard weight steel with primed finish and waterstop/anchor continuously welded to sleeve. If piping carries only fluids below 120°F, sleeves may be thermoplastic with integral water seal and textured surface.

3. Sleeves shall be at least 2 pipe sizes larger than the pipes.
4. Pressure shall be maintained by stainless steel bolts and other parts. Pressure plates may be of composite material for Models S and OS.
5. Sealing element shall be as follows:

		Element	
Model	Service	Material	Temperature Range
S	Standard (Stainless)	EPDM	-40°F to 250°F
T	High/Low Temperature (Steam)	Silicone	-67°F to 400°F
T	Fire Seals (1 hour)	Silicone	-67°F to 400°F
FS	Fire Seals (3 hours)	Silicone	-67°F to 400°F
OS	Oil Resistant/Stainless	Nitrile	-40°F to 210°F

6. Manufacturers:

   a. Thunderline Corporation "Link-Seals"
   b. Metraflex Company (cold service only)

2.8 ESCUTCHEON PLATES AND TRIM

A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.

B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.

C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.9 PIPE PENETRATIONS

A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.

B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.10 PIPE ANCHORS

A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.

B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.11 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 PLUMBING SUPPORTS AND ANCHORS

A. General Installation Requirements:

1. Install all items per manufacturer's instructions.
2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with sheet metal contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.

B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

C. Pipe Requirements:

1. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
4. Piping shall not introduce strains or distortion to connected equipment.
5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.

7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.

D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:

1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:

    a. The hanger is attached within 6" from a web/chord joint.
    b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.

3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.

E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.

F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.

H. Steel/Concrete Structure: Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the spacing as defined in 2022 CPC, Table 313.3 as applied to each piping system.

1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):

    a. Maximum Spacing:

        1) 1-1/4" & under: 7'-0"
        2) 1-1/2": 9'-0"
        3) 2": 10'-0"
        4) 2-1/2": 11'-0"
        5) 3": 12'-0"
        6) 4" & larger: 12'-0"

2. Steel (Std. Weight or Heavier - Vapor Service):

    a. Maximum Spacing:

        1) 1/2" and under: 6'-0"
        2) 3/4" to 1": 8'-0"
        3) 1-1/4" and under: 9'-0"
        4) 1-1/2": 10'-0"
        5) 2" & larger: 10'-0"

3. Hard Drawn Copper & Brass (Liquid Service):

    a. Maximum Spacing:

        1) 3/4" and under: 5'-0"
        2) 1": 6'-0"
        3) 1-1/4": 6'-0"
        4) 1-1/2" 6'-0"
        5) 2": 8'-0"
        6) 2-1/2": 9'-0"
        7) 3": 10'-0"
        8) 4": 10'-0"
        9) 6": 10'-0"

4. Hard Drawn Copper & Brass (Vapor Service):

    a. Maximum Spacing:

        1) 3/4" & under: 6'-0"
        2) 1": 6'-0"
        3) 1-1/4": 6'-0"
        4) 1-1/2": 6'-0"
        5) 2": 10'-0"
        6) 2-1/2" & larger: 10'-0"

5. Plastic Pipe:

    a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" (1220 mm) maximum centers.

6. Ultra-Flexible Pipe, and Flexible Hose, and Soft Copper Tubing:

    a. Continuous channel with hangers maximum 8'-0" OC.

I. Wood Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):

a. Maximum Spacing:

1) 1-1/4" & under: 7'-0"
2) 1-1/2": 9'-0"
3) 2": 10'-0"
4) 2-1/2": 11'-0"
5) 3": 12'-0"
6) 4" through 6": 12'-0"
7) 8": 9'-0"
8) 10": 6'-0"
9) 12": 4'-0"

2. Steel (Std. Weight or Heavier - Vapor Service):

a. Maximum Spacing:

1) 1/2" and under: 6'-0"
2) 3/4" to 1": 8'-0"
3) 1-1/4" and under: 9'-0"
4) 1-1/2": 10'-0"
5) 2" & larger: 10'-0"
6) 3": 12'-0"
7) 4" through 8": 12'-0"
8) 10": 9'-0"
9) 12": 6'-0"

3. Hard Drawn Copper & Brass (Liquid Service):

a. Maximum Spacing:

1) 3/4" & under: 5'-0"
2) 1": 6'-0"
3) 1-1/4": 6'-0"
4) 1-1/2": 6'-0"
5) 2": 8'-0"
6) 2-1/2": 9'-0"
7) 3": 10'-0"
8) 4": 10'-0"
9) 6": 10'-0"

4. Hard Drawn Copper & Brass (Vapor Service):

a. Maximum Spacing:

1) 3/4" & under: 6'-0"
2) 1": 6'-0"
3) 1-1/4": 6'-0"
4) 1-1/2": 6'-0"
5) 2": 10'-0"
6) 2-1/2" & larger: 10'-0"

5. Plastic Pipe:

    a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.

6. Ultra-Flexible Pipe, Flexible Hose, and Soft Copper Tubing:

    a. Continuous channel with hangers maximum 8'-0" OC.

J. Installation of hangers shall conform to MSS SP-58, 69, 89 and the applicable Plumbing Code.

END OF SECTION

SECTION 22 05 50 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 22 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

D. Installer: Company specializing in performing the work of this Section.

1.3 REFERENCES

A. California Building Code (CBC)ASHRAE - A Practical Guide to Seismic Restraint.

B. ASCE 7-16, Chapter 13.

C. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems.

D. NFPA 13 - Installation of Sprinkler Systems.

E. NFPA 14 - Standpipe and Hose Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 22 05 00.

B. Submittal to Code Official:

1. Contractor shall submit copies of the seismic shop drawings to the governing code authority for approval.

C. Shop Drawings:

1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Structural Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
2. Coordination Drawings: Plans and sections drawn to scale, coordinating seismic bracing of mechanical components with other systems and equipment in the vicinity, including other seismic restraints.
3. Manufacturer's Certifications: Professional Structural Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
4. System Supports/Restraints - Submit for each condition requiring seismic bracing:

    a. Calculations for each seismic brace and detail utilized on the project.
    b. Plan drawings showing locations and types of seismic braces on contractor fabrication/installation drawings.
    c. Cross-reference between details and plan drawings to indicate exactly which brace is being installed at each location. Details provided are to clearly indicate attachments to structure, correctly representing the fastening requirements of bracing.
    d. Clear indication of brace design forces and maximum potential component forces at attachment points to building structure for confirmation of acceptability by the Structural Engineer of Record.

5. Equipment - Submit for each piece of equipment supplied:

    a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified.
    b. Specific details of seismic design features of equipment and maximum seismic loads imparted to the structural support.
    c. Engineering calculations and details for equipment anchorage and support structure.

D. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.5 TESTING AND INSPECTION

A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the California Building Code.

B. The Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.

D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.7 DESIGN REQUIREMENTS

A. This project is subject to the seismic bracing requirements of the California Building Code, 2022 edition.

B. The following criteria are applicable to this project:

1. Seismic Use Group: III
2. Occupancy Category: III
3. Risk Category: IV
4. Seismic Importance Factor: IE = 1.25Seismic Design Category: D
5. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 1621.3r in CBC 2016 for the individual equipment or system being restrained.

6. Component Importance Factors (Ip) shall be taken from Section 1621.1.6 in CBC 2016 for the individual equipment or system being restrained.
7. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.

C. Forces shall be calculated with the above requirements and Equations of CBC 2016 unless exempted by 13.1.4.

D. Equipment shall meet California Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

E. All seismic anchorage and bracing shall comply with the St. Louis County Rules & Regulations on Anchorage & Sway Bracing - Mechanical, Electrical & Plumbing (MEP) System Components.

F. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.8 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

1.9 WARRANTY

A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation http://www.unistrut.us/
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, https://virs.vibro-acoustics.com/

2.2 SEISMIC DESIGN CRITERIA

A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions:

1. Stay in Place:

a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

D. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.

B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:

1. Air Compressors
2. Pumps
3. Tanks

2.5 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.6 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.7 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 1011, GR 33.
2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.

B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.

C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.

D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.

F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.

H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.

I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.

K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.

L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.

M. Do not install cables over sharp corners.

N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.

O. Provide reinforced clevis bolts when required.

P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

Q. Post-Installed anchors shall be provided to meet seismic requirements.

R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.

S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.

U. Water tanks shall be secured to their saddles by welding or proper concrete attachment, and those saddles shall be properly attached to the structure.

V. Brace all terminal units with water coils as required by the building code and provide flexible connection to the coil if bracing is required.

W. Independently brace duct mounted equipment (terminal units, in-line fans, etc.) and the associated suspended ductwork.

X. Do not brace a system to two different structures such as a wall and a ceiling.

Y. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

Z. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.

AA. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

BB. Coordinate seismic bracing of architecturally exposed ductwork with the Architect/Engineer.

3.2 SEISMIC RESTRAINT EXCLUSIONS

A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION

SECTION 22 05 53 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 22.

1.2 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM B-1, B-3, and B-8 for copper conductors.

C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 " 2kV Cables.

D. CGA Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders for Medical Use.

E. NFPA-99: Health Care Facilities.

F. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

1.3 SUBMITTALS

A. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. 3M
2. Seton
3. W.H. Brady

2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

Plastic tags may be used for outside diameters under 3/4"

B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.

C. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

D. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

E. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape 6" wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item.

F. Tracer Wire:

1. Single copper conductors shall be solid or stranded annealed or hard uncoated copper per UL83 and ASTM requirements. Tracer tape or copper-coated steel wire is not acceptable.
2. Conductor shall be insulated with HMWPE as specified and applied in a concentric manner. The minimum at any point shall not be less than 90% of the specified average thickness in compliance with UL 83.
3. Tracer wire shall be continuously spark tested at 7500 Volts DC. Other electrical and mechanical tests shall be in accordance with UL 1581.

G. Ceiling Markers:

1. Label Style:

a. The intent is for the ceiling labels to be inconspicuous but easy to find and read while standing underneath. The labels shall be located on the grid T-bar nearest the ceiling tile that can be removed to provide the best access to the serviceable side of equipment or to valves. An arrow can be used to point to the tile needing removal.
b. The label tape shall be approximately 1/2" wide with all capitalized letters approximately 3/16" tall.
c. Ceiling grid labels shall be made with a label maker with durable adhesive labels having a clear background and black letters.
d. Equipment labels shall be as designated on the drawings (e.g., WHA, TP, etc.).
e. Valve labels shall be designated by the size, service, and the valve tag number (e.g., 1-1/4" CW #123, 2" HWS #234, etc.). A single longer label can be used to identify multiple valves using spaces between the descriptors if the valves are located close together and have the same service (e.g., CW, HW, and HWC lines serving the same restroom, etc.).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shutoff valves at equipment) shall have numbered tags.
2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
6. Number all tags and show the service of the pipe.
7. Provide one Plexiglas framed valve directory listing all valves, with respective tag numbers, uses and locations. Mount directory in location chosen by the Architect/Engineer.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.
3. Apply markers and arrows in the following locations where clearly visible:
    a. At each valve.
    b. On both sides of walls that pipes penetrate.
    c. At least every 20 feet along all pipes.
    d. On each riser and each leg of each "T" joint.
    e. At least once in every room and each story traversed.
4. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

F. Tracer Wire:

1. Tracer wire shall be installed on top of all non-metallic buried utilities.
2. Tracer wire shall be taped directly to plastic water or drain pipe.
3. Tracer wire shall not be fastened directly or indirectly to gas piping.
4. Tracer wire when attached shall be secured to the pipe a minimum of every 10 feet and at all changes of direction.
5. Tape shall be Polyken "930-35", Protecto-Wrap "310", or approved equal.
6. Tracer wire shall be continuous between boxes and shall be tested for continuity.
7. Splices in tracer wire shall be made with a water proof splice kit to prevent corrosion. Wire nuts shall not be used.
8. The tracer wire shall daylight to grade through a 2" PVC conduit, at the point of the utility entrance to building. PVC conduit shall be capped and labeled as future contact point to locate the utility.

3.2 SCHEDULE

A. Pipes to be marked shall be labeled with text as follows, regardless of which method or material is used:

1. CONDENSATE DRAIN: White lettering; green background
2. DOMESTIC COLD WATER: White lettering; green background
3. DOMESTIC HOT WATER - 115°F: White lettering; green background
4. DOMESTIC HOT WATER CIRCULATING - 115°F: White lettering; green background
5. SANITARY SEWER: Black lettering; yellow background
6. VENT: Black lettering; yellow background
7. STORM SEWER (PRIMARY AND SECONDARY): White lettering; green background
8. All Underground Pipes: Varies
9. Tracer Wire - Natural Gas Pipe Lines: Black lettering; yellow background
10. Tracer Wire - All other buried types: White lettering; green background

B. Ceiling Markers:

1. CONTROL VALVE

2. TRAP PRIMER

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

B. Insulation Jackets.

1.2 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with five years minimum experience.

B. Materials: Listed and labeled for flame spread/smoke developed rating of no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:

1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

1.3 REFERENCES

A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

B. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

C. ANSI/ASTM C534 - Elastomeric Foam Insulation.

D. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.

E. ASTM C1126 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

F. ASTM C1729 - Standard Specification for Aluminum Jacketing for Insulation.

G. ASTM C1767 - Standard Specification for Stainless Steel Jacketing for Insulation.

H. ASTM E84 - Surface Burning Characteristics of Building Materials.

I. NFPA 255 - Surface Burning Characteristics of Building Materials.

J. UL 723 - Surface Burning Characteristics of Building Materials.

K. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

L. California Title 24 - Building Energy Efficiency Standards.

1.4 SUBMITTALS

A. Submit specification and data sheets per Section 22 05 00. Include product description, list of materials and thickness for each service, and locations.

PART 2 - PRODUCTS

2.1 INSULATION

A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; non-combustible. All-purpose polymer or polypropylene service jacket, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.

B. Type B: Flexible elastomeric foam insulation; closed-cell, sponge or expanded rubber (polyethylene type is not permitted); ANSI/ASTM C534 Grade 1 Type I for tubular materials; flexible plastic; 0.25 maximum 'K' value at 75°F, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Maximum 1" thick per layer where multiple layers are specified.

2.2 VAPOR BARRIER JACKETS

A. All-purpose polymer or polypropylene service jacket vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.3 JACKET COVERINGS

A. Aluminum Jackets: ASTM C1729; 0.016" thick (thicker where required by ASTM C1729); stucco embossed finish with Z edge seams and aluminum bands for outdoor use. Where colored jacket covers are called for, provide factory-applied hard film acrylic paint in color selected by Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.2 INSTALLATION

A. General Installation Requirements:

1. Install materials per manufacturer's instructions, building codes and industry standards.
2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.

B. Insulated Piping Operating Below 60°F:

1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
2. On piping operating below 60°F in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
3. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve.

C. Insulated Piping Operating Between 60°F and 140°F:

1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.

D. Insulated Piping Operating Above 140°F:

1. Insulate fittings, valves, flanges, and strainers.
2. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

E. Exposed Piping:

1. Locate and cover seams in least visible locations.

2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
3. On exposed piping serving kitchen equipment or plumbing fixtures, the piping shall be insulated unless local code allows it to be uninsulated. In no instance should the uninsulated portion of the piping be more than 4ft in developed length.

3.3 SUPPORT PROTECTION

A. Provide a shield on all insulated piping at each support between the insulation jacket and the support.

B. On all insulated piping greater than 1-1/2", provide shield with insulation insert of same thickness and contour as adjoining insulation at each support, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Inserts shall be as follows:

1. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a minimum 180° cylindrical segment the same length as metal shields. Inserts shall be:

a. Molded hydrous calcium silicate (only use for pipes with operating temperatures above 90°F, with a minimum compressive strength of 100 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
b. As an alternative to separate pipe insulation insert and saddle, properly sized manufactured integral rigid insulation insert and shield assemblies may be used.

1) Products:

a) Buckaroo CoolDry
b) Cooper/B-Line Fig. B3380 through B3384
c) Pipe Shields A1000, A2000

c. Insulation Couplings:

1) Molded thermoplastic slip coupling, -65°F to 275°F, sizes up to 4-1/8" OD, and receive insulation thickness up to 1". Suitable for use indoors or outdoors with UV stabilizers. Vertical insulation riser clamps shall have a 1,000lb vertical load rating. On cold pipes operating below 60°F, cover joint and coupling with vapor barrier mastic to ensure continuous vapor barrier.
2) Horizontal Strut Mounted Insulated Pipe Manufacturers:

a) Klo-Shure or equal

3) Vertical:

a) Manufacturers: Klo-Shure Titan or equal

d. Rectangular blocks, plugs, or wood material are not acceptable.
e. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor. Refer to Supports and Anchors specification section for additional information.

C. Neatly finish insulation at supports, protrusions, and interruptions.

D. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.

E. Shields shall be at least the following lengths and gauges:

Pipe Size	Shield Size
1/2" to 3-1/2"	12" long x 18 gauge
4"	12" long x 16 gauge
5” to 6"	18" long x 16 gauge
8” to 14"	24" long x 14 gauge
16” to 24"	24" long x 12 gauge

F. Ferrous hot piping 4 inches and larger, provide steel saddle at rollers as described in Section 22 05 29 "Plumbing Supports and Anchors".

G. Minimum 1/4" rolled galvanized steel plates shall be provided in addition to the sleeves as reinforcement on large pipes to reduce point loading on roller, trapeze hanger and strut support locations depending on insulation compressive strength. Refer to section above for exact locations.

3.4 INSULATION

A. Type A Insulation:

1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
3. Apply insulation with laps on top of pipe.
4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60°F seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Install per manufacturer's instructions or ASTM C1710.
2. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
3. Insulation Installation on Straight Pipes and Tubes:

    a. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
    b. Insulation must be installed in compression to allow for expansion and contraction. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

4. Insulation Installation on Valves and Pipe Specialties:

    a. Install preformed sections of same material as straight segments of pipe insulation when available.
    b. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
    c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.5 JACKET COVER INSTALLATION

A. Metal Covering:

1. Provide vapor barrier as specified for insulation type. Cover with aluminum jacket covering with seams located on the bottom of horizontal piping. Include fittings, joints and valves.
2. Seal all interior and exterior butt joints with metal draw bands and sealant. Seal all exterior joints watertight.
3. Interior joints do not need to be sealed.
4. Use metal covering on the following pipes:

    a. All exposed piping in finished spaces unless noted otherwise on the drawings.
    b. All exposed piping in unfinished areas as noted on drawings (e.g., storage rooms, janitor's closets, utility rooms, etc.).
    c. All exposed piping in mechanical or equipment rooms below 8'-0" above floor.
    d. All exposed piping in mechanical rooms that is subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)
    e. All exposed piping in tunnels designated as passageways, equipment access, or egress.

3.6 SCHEDULE

A. Refer to drawings for insulation schedule.

END OF SECTION

SECTION 22 08 00 - COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description

B. Responsibilities

C. Related Work

D. Test Equipment

1.2 DESCRIPTION

A. The purpose of this section is to specify Division 22 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in the Commissioning Plan (Cx Plan). Refer to Section 01 91 00.

C. Commissioning requires the participation of the Division 22 Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 01 91 00. Division 22 Contractor shall be familiar with all parts of Section 01 91 00 and the commissioning plan issued by the CxA, and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.3 RESPONSIBILITIES

A. Refer to the Cx Plan in the appendix of Section 01 91 00.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.

1. Section 01 78 23 - Operations and Maintenance
2. Section 01 79 00 - Demonstration and Training
3. Section 01 91 00 - Commissioning
4. Section 23 08 00 - Commissioning of HVAC

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall provide all test equipment necessary to fulfill the testing requirements of this Division. This equipment includes, but is not limited to, the following:

1. Infrared thermometer gun.
2. Portable computer with access to the building automation system.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. If not otherwise noted, the following minimum requirements apply:

1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of +/- 0.1°F.
2. Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.
3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

C. Refer to Section 01 91 00 for additional Division 22 requirements.

PART 3 - EXECUTION

A. Refer to the Cx Plan in the appendix of Section 01 91 00.

END OF SECTION

SECTION 22 09 00 - INSTRUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pressure Gauge.

B. Pressure Gauge Accessories.

C. Thermometers.

D. Test Plugs.

1.2 REFERENCES

A. ANSI/AWWA C700 - Cold Water Meters - Displacement Type, Bronze Main Case.

B. ANSI/AWWA C701 - Cold Water Meters - Turbine Type, for Customer Service.

C. ANSI/AWWA C702 - Cold Water Meters - Compound Type.

D. ANSI/AWWA C706 - Direct Reading, Remote Registration Systems for Cold Water Meters.

E. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

F. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.

G. ASTM E1 - Specification for ASTM Thermometers.

1.3 SUBMITTALS

A. Submit product documentation per Section 22 05 00. Include list that indicates use, operating range, total range and location for manufactured components.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

A. Gauges shall be 4-1/2" diameter with aluminum or stainless steel case with phosphor bronze bourdon tube, brass socket for water or oil application, 1/2" bottom connection. Gauges shall be 1% full scale accurate with bronze bushed brass movement and adjustable pointer. Standard ranges to be either pressure or pressure and vacuum as required of application.

1. Manufacturers:

a. Trerice
b. Weksler

B. Select gauge range for normal reading near center of gauge.

2.2 PRESSURE GAUGE ACCESSORIES

A. All pressure gauges shall have valves and pressure snubbers. All pressure gauges on steam shall have pigtail syphon.

B. Shutoff Valve: 1/2" ball valve as specified for each piping system.

C. Pressure snubber, brass with 1/2" connections, porous metal type.

D. All pressure gauge piping shall be minimum 1/2" 304 stainless steel pipe or copper tube.

2.3 THERMOMETERS

A. Digital Type:

1. 1/2" LCD digital display, solar powered, with high impact ABS case. Accuracy of 1% of reading or 1°F, whichever is greater. Adjustable elbow joint with locking device to allow rotation of thermometer to any angle.
2. Fahrenheit/Celsius switchable with -50/300°F range.
3. Through-case potentiometer recalibration adjustment.
4. Stem lengths as required for application, with minimum insertion of 2-1/2".
5. Thermometers for water shall have brass or steel separable socket. Thermometer wells shall be stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.
6. Digital display shall operate at 10 Lux (one foot-candle) or more. Use this thermometer only where ambient temperatures are below 140°F and there is sufficient light under normal occupied space conditions for the digital display to function. Use a different type thermometer where there is inadequate light available (e.g., dark mechanical rooms, locations where the thermometer is shielded from light, etc.).
7. Manufacturer:

a. Trerice
b. Weksler

B. Select scales to cover expected range of temperatures.

2.4 TEST PLUGS

A. Test Plug: 1/4" or 1/2" brass fitting and cap, with Nordel core for temperatures up to 275°F, for receiving 1/8" outside diameter pressure or temperature probe. Plugs shall be rated for zero leakage from vacuum to 500 psi.

B. Provide extended units for all plugs installed in insulated piping.

C. Test Kit: Carrying case, internally padded and fitted containing one 3-1/2" diameter pressure gauge with 0-100 psi range, one gauge adapter with 1/8" probes, two 1-1/2" dial thermometers with 0° to 220°F and -25°F to 125°F ranges and 5" stems.

D. Manufacturers:

1. Peterson Equipment
2. Trerice
3. Watts Regulator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install per manufacturer's instructions.
2. Coil and conceal excess capillary on remote element instruments.
3. Install gauges and thermometers in locations where they are easily read from normal operating level.
4. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

B. Pressure Gauges:

1. Connect pressure gauges to suction and discharge side of all pumps.
2. Provide 1/2" tubing for pressure gauge and gauge accessories.
3. Provide snubber for each pressure gauge.
4. Provide coil syphon for each pressure gauge connected to steam piping.

C. Thermometers:

1. Install piping system thermometers in sockets with short couplings. Enlarge pipes smaller than 2-1/2" for installation of thermometer sockets.
2. Install thermometer sockets adjacent to control system thermostat, transmitter and sensor sockets.

END OF SECTION

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Pipe Fittings.

B. Valves.

C. Check Valves.

1.2 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.

D. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

E. Pipe hangers and supports shall be spaced per 2022 CPC, Table 313.3, as applied to each pipe system listed. Refer to Section 22 05 29 for hanger and support components. Seismic supports shall be submitted as a deferred approval using OPM guidelines. Shop drawings shall be submitted for review to the AHJ: State, local or agency reviewing the project. Upon approval, these shop drawings shall be included in the record set.

F. Potable water piping and fittings shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2022 CPC: 604.2 Lead Content.

G. Valves for potable water systems shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2022 CPC: 604.2 Lead Content.

H. Hubless clamps shall meet FM 1680 for HCAI 1, 2 and 3.

1.3 REFERENCES

A. ANSI/ASME A112.3.1 - Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above and Below Ground.

B. ASME A112.6.9 - Siphonic Drain Test; The American Society of Mechanical Engineers.

C. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

D. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

E. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

F. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.

G. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.

H. ANSI/ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.

I. ANSI/ASME B31.3 - Chemical Plant and Petroleum Refinery Piping.

J. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

K. ANSI/ASTM B32 - Solder Metal.

L. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

M. ANSI/ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.

N. ANSI/AWS D1.1 - Structural Welding Code.

O. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings 3" through 48", for Water and Other Liquids.

P. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

Q. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

R. ANSI/AWWA C153 - Compact Ductile Iron Fittings 3" through 48", for Water and Other Liquids.

S. ASME - Boiler and Pressure Vessel Code.

T. ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.

U. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

V. ASTM A74 - Hub and Spigot Cast Iron Soil Pipe and Fittings.

W. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

X. ASTM A312 - Standard for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

Y. ASTM A554 - Standard for Welded Stainless Steel Mechanical Tubing.

Z. ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.

AA. ASTM A888 - Hubless Cast Iron Soil Pipe and Fittings.

BB. ASTM B88 - Seamless Copper Water Tube.

CC. ASTM B306 - Copper Drainage Tube (DWV).

DD. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

EE. ASTM C1540 - Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

FF. AWS A5.8 - Brazed Filler Metal.

GG. AWWA C651 - Disinfecting Water Mains.

HH. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

II. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

JJ. FM 1680 - Couplings Used in Hubless Cast Iron Systems.

KK. NFPA 24 - Private Fire Service Mains and Their Appurtenances.

LL. NSF - National Sanitation Foundation

MM. CCR - California Code of Regulation

NN. CBC - California Building Code

OO. CPC - California Plumbing Code

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

1.5 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 22 05 00 for required plumbing systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS

2.1 CAST IRON PIPE

A. Cast Iron; Standard Weight; Hub and Spigot Joints:
1. Pipe: Standard weight hub and spigot cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 and CISPI Trademark.

2. Design Pressure: Gravity Maximum Design Temperature: 180°F
3. Joints: Compression gasket, ASTM C564.
4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 301. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
5. Adapters: Heavy duty no-hub transition for joining cast iron and PVC pipe. Adapters shall be tested and certified to ASTM C 1460 and be constructed with Type 304 stainless steel shield, thickness 0.015" shield, gasket material to meet ASTM C564, 1-1/2" to 4" will be 3" wide with four 304 stainless steel bands, and 6" to 10" will be 4" wide with six 304 stainless steel bands and 3/8" 305 stainless steel hex head screws torqued to 80 inch pounds.

B. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets:

1. Pipe: Standard weight no-hub cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 and CISPI Trademark.
2. Design Pressure: Gravity Maximum Design Temperature: 180°F
3. Joints: ASTM C1540, FM 1680, and ASTM C-564.

    a. Super Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.015" thick 304 stainless steel shield , stainless steel 3/8" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky SD-4000 or equal.

4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 310. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
5. Adapters: Transitions from cast iron soil pipe to other pipe materials with manufactured adapters specifically for the application. Adapter must meet the same requirements as the joints listed above. ASTM C1460. Sticker identifying transition fitting application must be visible to view.

C. Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets:

1. Pipe and Fittings: Standard weight no-hub cast iron soil pipe, epoxy paint corrosion protective coating inside and outside, CISPI 301 and CISPI Trademark.
2. Joints: ASTM C1540 and FM 1680.

    a. Super Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.015" thick 304 stainless steel shield , stainless steel 3/8" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky SD-4000 or equal.

3. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 301. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
4. Adapters: Transitions from cast iron soil pipe to other pipe materials with manufactured adapters specifically for the application. Adapter must meet the same requirements as the joints listed above. ASTM C1460. Sticker identifying transition fitting application must be visible to view.

2.2 COPPER PIPE

A. Copper Pipe; Type L; Solder Joints:

1. Pipe: Type L hard drawn seamless copper tube, ASTM B88.
2. Design Pressure: 175 psi; Maximum Design Temperature: 200°F.
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

B. Copper Pipe; Type K; Solder Joints:

1. Pipe: Type K annealed copper tube, ASTM B88.
2. Design Pressure: 150 psi. Maximum Design Temperature: 200°F.
3. Joints: Solder with 100% lead-free solder and flux ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

C. Copper Pipe: Type DWV; Solder Joints:

1. Pipe: Type DWV hard temper seamless copper drainage tube, ASTM B306.
2. Design Pressure: Gravity Maximum Design Temperature: 180°F
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Cast brass solder joint drainage type, ANSI B16.23 or wrought copper solder joint drainage type, ANSI B16.29.

D. Copper Pipe: Type M; Solder Joints:

1. Pipe: Type M hard temper seamless copper drainage tube, ASTM B306.
2. Design Pressure: Gravity Maximum Design Temperature: 180°F
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Cast brass solder joint drainage type, ANSI B16.23 or wrought copper solder joint drainage type, ANSI B16.29.

2.3 GALVANIZED STEEL PIPE

A. Galvanized Steel; Standard Weight; Threaded Joints:

1. Pipe: Galvanized; standard weight galvanized steel, ASTM A53, threaded and coupled.
2. Design Pressure: 175 psi; Maximum Design Temperature: 200°F.
3. Joints: screwed.

4. Fittings: Malleable iron, ASTM A47, Grade 32510, galvanized with grooved ends or 125# steam - 175# CWP, galvanized cast iron, ASTM A126, ANSI B16.4.
5. Flanges: Grooved end, galvanized flanged adapter nipples, Gustin Bacon No. 54, Victaulic No. 54 or 125# steam - 175# CWP, galvanized cast iron, screwed, ASTM A126, Grade B, ANSI B16.1, with galvanized or cadmium plated bolting.

B. Galvanized Steel; Standard Weight; Welded Joints:

1. Pipe: Standard weight galvanized steel, beveled ends, ASTM A53.
2. Design Pressure: 125 psiMaximum Design Temperature: 350°F
3. Joints: Butt welded and flanged. (All welded joints shall be ground, primed, and painted.)
4. Fittings: Standard weight seamless galvanized steel, butt weld type, ASTM A234, Grade WPB, ANSI B16.9.
5. Flanges: 150# forged steel, weld neck or slip-on, ASTM A181, Grade I, ANSI B16.5.
6. Other: Grind galvanizing off areas to be welded before welding, perform welding, and then clean surfaces and paint with one coat of rust-inhibiting metal primer and when dry one coat of oil base aluminum enamel.

2.4 VALVES

A. Shutoff Valves:

1. Ball Valves:

a. BA-1: 3" and under, 150 psi saturated steam, 600 psi CWP, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-255-FB-P-UL, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

1) Provide solid extended shaft for all insulated piping.
2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

B. Throttling Valves

1. Globe Valves:

a. GL-1: 2" and under, 150# saturated steam, 300# CWP, screwed, bronze. Crane #7TF, Stockham #B22T, Walworth #3095, Milwaukee #590, Hammond #IB413T, Watts #B-4010-T, Nibco T-235Y.

2.5 STRAINERS

A. For pipe systems where mechanical press connections are allowed, strainers with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

B. ST-1: Bronze body, screwed ends, screwed cover, 150 psi S @ 350°F, 200 psi CWP @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777.

2.6 CHECK VALVES

A. For pipe systems where mechanical press connections are allowed, check valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

B. CK-1: 2" and under, 125# steam @ 406°F, 200# CWP @ 150°F, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319-Y, Walworth #3406, Milwaukee #509, Watts #G-5000, Nibco T-413B.

2.7 VALVE BOX/CURB BOX

A. VB-1: 2" and under, extension type curb box with arch pattern base and sufficient length to allow top to terminate flush with finished grade. Cast iron lid with integrally cast brass bushing and marked "water" in integrally cast raised letters. Furnished with valve operating wrench of sufficient length to extend 3' above finished grade when engaged with valve. Construction of curb box shall meet all local codes and requirements. Mueller H-10000 Series, A.Y. McDonald 5600 Series, Tyler Pipe 6500 Series.

2.8 LOCK OUT TRIM

A. Provide lock out trim for all quarter turn shutoff valves opening to atmosphere and installed in domestic water piping over 120°F and as indicated on the drawings.

2.9 VALVE OPERATORS

A. Provide handwheels for gate valves and gear operators for butterfly valves.

2.10 VALVE CONNECTIONS

A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

2.11 CONNECTIONS BETWEEN DISSIMILAR METALS

A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze, galvanized steel and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron and steel connected to each other.
2. Brass, copper, and bronze connected to each other.
3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed and/or Grooved Joints (acceptable up to 4" size):

1. Dielectric waterway rated for 300 psi CWP and 225°F.
2. Optional: Copper-silicon casting conforming to UNS C87850 with grooved and/or threaded ends.
3. UL classified in accordance with ANSI / NSF-61 for potable water service.
4. Manufacturers:

a. Victaulic Series 647
b. Grinnell Series 407

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
6. Manufacturers:

a. Central Plastics
b. Pipeline Seal and Insulator

PART 3 - EXECUTION

3.1 PREPARATION

A. Install all products per manufacturer's recommendations.

B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

C. Remove scale and dirt, on inside and outside, before assembly.

D. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.

E. Connect to equipment with flanges or unions. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

F. Use only piping materials rated for the maximum temperature of the application, e.g., do not use PVC for dishwasher drainage or piping that receives boiler blowdown.

G. Roof Penetration (Vent) Flashing:

1. Built-up Roofing: Flash vents with 3# seamless sheet lead of sufficient size to extend 15" into roofing felts for built-up roofs.
2. Membrane, Metal or Shingled Roofs: Flash vents with premolded pipe flashing cones for single-ply membrane roofs, metal roofs, or shingled roofs.

H. Existing building sewers or building drains which are shown on the documents to be reused shall be inspected and recorded by closed circuit television for their condition. Report findings back to the Architect, Engineer, and Owner before proceeding with work so any necessary rework can take place if needed.

3.2 SYSTEM, PIPING AND VALVE SCHEDULE

A. Cold Water, Hot Water, Tempered Water - Potable and Non-Potable (Above Ground):

1. Copper Pipe; Type L; Solder Joints: All Sizes
2. Galvanized Steel; Standard Weight; Threaded Joints: 6" and Over
3. Shutoff Valves:, BA-1
4. Throttling Valves: GL-1
5. Check Valves: CK-1Strainers: ST-1

B. Cold Water, Hot Water, Tempered Water - Potable and Non-Potable (Underground):

1. Copper Pipe; Type K; Solder Joints: All Sizes

C. Shutoff Valves: BA-1, BA-1ASanitary Waste and Vent, Gravity (Above Ground):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
3. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
4. Galvanized Steel; Standard Weight; Threaded Joints: 4" and under

D. Sanitary Indirect Drainage (Above Ground):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
3. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
4. Galvanized Steel; Standard Weight; Threaded Joints: 4" and under

E. Storm Drainage, Gravity (Above Ground):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
3. Galvanized Steel; Standard Weight; Threaded Joints: 4" and under

F. Sanitary Waste and Vent, Gravity (Underground - Inside Building):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"

G. Storm Drainage, Gravity (Underground - Inside Building):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"

H. Sanitary Waste and Vent, Gravity (Underground - Outside Building):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"

I. Storm Drainage, Gravity (Underground - Outside Building):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"

J. Shutoff Valves: BA-1, BA-1ACondensate/Equipment Drainage:

1. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
2. Copper Pipe: Type M; Solder Joints: 1-1/4" to 4"

3.3 TESTING PIPING

A. Sanitary Drainage, Storm Drainage:

1. Test all piping with water to prove tight.
2. Test piping before insulation is applied.
3. Hydrostatically test all soil, waste, and vent piping inside of building with 10 feet head of water for 15 minutes. Inspect before fixtures are connected. If leaks appear, repair them and repeat the test.
4. Hydrostatically test interior downspouts with 10 feet head of water for 15 minutes with no leaks.
5. A smoke/air test at the same pressure may be used in lieu of the hydrostatic water test. Exception: Smoke/air test shall not be performed on plastic piping.

6. Test force mains with water at 105% of the operating pump discharge pressure for 15 minutes.
7. Test pressures stated above shall be as listed or as required by the Authority Having Jurisdiction, whichever is most stringent.
8. Test piping per CPC requirements.

B. Hot Water - Potable and Non-Potable, Cold Water - Potable and Non-Potable, Service Water:

1. Test pipes underground or in chases and walls before piping is concealed.
2. Test all pipes before the insulation is applied. If insulation is applied before the pipe is tested and a leak develops which ruins the insulation, replace damaged insulation.
3. Test the pipe with 100 psig water pressure or equal inert gas such as nitrogen. Exception: Inert gas test shall not be used to test plastic piping.
4. Hold test pressure for at least 2 hours.
5. Test to be witnessed by the Architect/Engineer's representative, if requested by the Architect/Engineer.

C. All Other Piping:

1. Test piping at 150% of normal operating pressure.
2. Piping shall hold this pressure for one hour with no drop in pressure.
3. Test piping using water, nitrogen, or air as compatible with the final service of the pipe. Do not use combustible fluids.
4. Drain and clean all piping after testing is complete.

3.4 CLEANING PIPING

A. Assembly:

1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer's representative. Blow chips and burrs from machinery or thread cutting operation out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing.
3. Notify the Architect/Engineer's representative before starting any post erection cleaning in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative regarding specific procedures and scheduling. Dispose of cleaning and flushing fluids properly.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and be certain all strainer screens are in place.

B. Air Blow:

1. Blow out pipe and components with clean compressed air. Instrument air, argon, nitrogen and sulfuric acid lines shall be blown out with dry, oil free air or nitrogen gas. "Oil Free" is defined as air compressed in a centrifugal, Teflon ring, carbon ring or water pumped air compressor. Where air supply is judged to be inadequate to continually attain cleaning velocity, alternate pressurization and sudden relief procedure may be used until discharge at all blow out points is clean. Use 80-90 psig pressure unless otherwise indicated.
2. Air blow applies to the following systems:

    a. Acetylene
    b. Carbon Dioxide
    c. Nitrogen (use oil free air or nitrogen gas)
    d. Argon (use oil free air or nitrogen gas)
    e. Instrument Air (use oil free air or nitrogen gas)
    f. Distilled Water (use maximum of 50 psig pressure)
    g. Chemical Feed
    h. Air Compressor Intakes
    i. Sulfuric Acid (use oil free air or nitrogen gas)

C. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.
3. If necessary, remove valves to clean out all foreign material.

D. Fire Service:

1. Flush all underground piping with minimum flow equal to the system design flow but not less than the following:

    a. 390 gpm for 4" pipes.
    b. 880 gpm for 6" pipes.
    c. 1560 gpm for 8" pipes.
    d. 2440 gpm for 10" pipes.
    e. 3500 gpm for 12" pipes.

3.5 INSTALLATION

A. General Installation Requirements:

1. Provide dielectric connections between dissimilar metals.
2. Route piping in orderly manner and maintain gradient. Install to conserve building space.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
5. Slope water piping and arrange to drain at low points.

6. Install bell and spigot piping with bells upstream.
7. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
8. Seal pipes passing through exterior walls with a wall seal per Section 22 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
9. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
10. All vertical pipe drops to sinks or other equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.

B. Installation Requirements in Electrical Rooms:

1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.

C. Valves/Fittings and Accessories:

1. Install shutoff valves that permit the isolation of equipment/fixtures in each room without isolating any other room or portion of the building. Individual fixture angle stops do not meet this requirement. Exception: Back-to-back rooms in no more than two adjacent rooms.
2. Provide clearance for installation of insulation and access to valves and fittings.
3. Provide access doors for concealed valves and fittings.
4. Install valve stems upright or horizontal, not inverted.
5. Provide one plug valve wrench for every ten plug valves 2" and smaller, minimum of one. Provide each plug valve 2-1/2" and larger with a wrench with set screw.
6. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

D. Underground Piping:
1. Install buried water piping outside the building with at least 5 feet of cover.Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements
2. Install buried borosilicate glass pipe with the protective polystyrene covering intact. Lay the pipe on bedding and backfill per manufacturer instructions.
3. Underground fire protection service piping shall have at least 6-1/2 feet of cover, or as recommended by NFPA 24.
4. Install thrust blocking and restraints on all underground fire protection service piping per NFPA 24 and as shown on drawings.
5. Install underground, sleeved, corrugated, stainless steel tubing system according to manufacturer's written instructions. Extend vent from sleeve to exterior of building and terminate with screened elbow.

6. Direct buried, uninsulated steel pipe shall have a factory applied external protective coating consisting of two coats with an intermediate layer of 18 mil fibrous glass mat. Coating thickness shall total not less than 3/32". The outer coating shall be further protected by a wrapping of heavy Kraft paper. This external protection shall extend and be exposed for a minimum of 1 foot beyond the buried or concealed portion of the pipe.

    a. Manufacturers:

        1) Pipe Line Service Co., Franklin Park, Illinois
        2) Lithcote Corp., Melrose Park, Illinois

7. As an option, the Contractor may provide factory applied protective coatings consisting of a polyethylene plastic film bonded to the pipe surface by a hot applied thermo-plastic adhesive.

    a. Manufacturers:

        1) Republic Steel Corp. "X-Tru-Coat"

8. Exercise care in handling, storing and laying pipe to avoid damaging factory applied coatings. If any damage occurs, repair the coating to a condition equal to the original.
9. Field application of protective coatings to joints, fittings and to any damaged factory applied coatings shall be similar to factory applied coatings specified above and shall be done in strict accordance with recommendations of the supplier of pipe coatings.
10. After completion of the fabrication, laying and field coating of the joints and fittings, but prior to backfilling, inspect the entire line in the presence of the Architect/Engineer's representative with an electronic holiday detector. Any defects in the protective coatings shall be repaired in accordance with requirements for original coatings.
11. Coat flange bolts and nuts in pits and below ground at the time of installation with a corrosion protective coating.

E. Sanitary and Storm Piping:

1. Install all sanitary and storm piping inside the building with a slope as shown on the drawings.
2. Install horizontal offset at all connections to roof drains to allow for pipe expansion.
3. Slope sanitary and storm piping outside the building to meet invert elevations shown on drawings and to maintain a minimum velocity of 2 feet per second.
4. Sway Bracing: Where horizontal sanitary and/or storm pipes 4 inches and larger change flow direction greater than 45°, rigid bracing or thrust restraints shall be installed to resist movement of the upstream pipe in the direction of pipe flow. The rigid bracing or thrust restraint shall be connected to structure. A change of flow direction from horizontal into a vertical pipe does not require the upstream pipe to be braced.

5. All sanitary and storm piping shall have at least 42" of cover when leaving the building.
6. Starter fittings with internal baffles are not permitted.

3.6 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.

B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.

D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.

E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.

F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.

G. Provide flanges or unions at all final connections to equipment, traps and valves.

H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shutoff valves.

I. Use full and double lengths of pipe wherever possible.

J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.

K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.

L. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements.

M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45° or 90° angle from the horizontal plane for air lines, and from top, bottom or side for liquids.

N. Do not use geotextile fabric with footing tile if silt content of soil exceeds 40% or if clay content exceeds 50%. The fabric shall be installed around 1" river rock or 2" limestone.

3.7 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal water lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.

B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.

C. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.

D. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.

E. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.

F. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.

G. All vent and drain piping shall be of same materials and construction for the service involved.

3.8 PLUMBING VENTS

A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.

B. Extend the high side of the soil and waste stacks at least 12" above roof.

C. Flash pipes at the roof with 3# lead sheet. Extend flashing under roofing 15" in all directions from pipe to be flashed. Extend a lead collar up on the outside of pipe to be flashed and extend 1" beyond the top of the pipe. The 1" excess length of collar shall be turned down into the top of the pipe where it shall fit tight to the inside of the pipe.

D. Flash pipes at roof with premolded EPDM pipe flashing cones adhered to roof membrane by General Contractor. Secure top of cone with stainless steel clamp and seal watertight.

E. Increase vent pipes through the roof two pipe sizes with long increasers located at least 12" below the roof.

F. In no case shall the vent through the roof be less than 4" in diameter.

G. Vent pipes through the roof shall be located a minimum of 25 feet from any air intake opening on the roof.

3.9 BRANCH CONNECTIONS

A. For domestic water and vent systems only, make branch connections with standard tee or cross fittings of the type required for the service.

B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.

C. Do not use double wye or double combination wye and eighth bend DWV fittings in horizontal piping.

D. Branch connections from the headers and mains may be mechanically formed using an extraction device. The branch piping connection shall be brazed connection for the following services only:

1. Domestic water piping above ground.

E. Further limit use of mechanically formed fittings as follows:

1. Must have at least same pressure rating as the main.
2. Main must be Type K or L copper tubing.
3. Permanent marking shall indicate insertion depth and orientation.
4. Branch pipe shall conform to the inner curve of the piping main.
5. Main must be 1" or larger.
6. Branch must be 3/4" or larger.

F. Forged weld-on fittings are limited as follows:

1. Must have at least same pressure rating as the main.
2. Main must be 2-1/2" or larger.
3. Branch line is at least two pipe sizes under main size.

3.10 JOINING OF PIPE

A. Threaded Joints (Galvanized Steel Pipe):

1. Threads shall conform to ANSI B2.1 "Pipe Threads".
2. Protect plated pipe and valve bodies from wrench marks when making up joints.
3. Apply thread lubricant to male threads as follows:

a. Vents and Roof Conductors: Red graphite
b. All Other Services: Teflon tape

B. Flanged Joints (Galvanized Steel Pipe):

1. Steel pipe flanges shall conform to ANSI B16.5 "Steel Pipe Flanges and Flanged Fittings". Cast iron pipe flanges shall conform to ANSI B16.1 "Cast Iron Flanged and Flanged Fittings". Steel flanges shall be raised face except when bolted to flat face cast iron flange.
2. Bolting for services up to 500°F shall be ASTM A307 Grade B with square head bolts and heavy hexagonal nuts conforming to ANSI B18.2.1 "Square and Hex Bolts" and B18.2.2 "Square and Hex Nuts".
3. Set flange bolts beyond finger tightness with a torque wrench for equal tension in all bolts. Tighten bolts so those 180° apart are torqued in sequence.
4. Gaskets for flat face flanges shall be full face type. Gaskets for raised faced flanges shall conform to requirements for "Group I Gaskets" in ANSI B16.5. Unless otherwise specified gaskets shall meet the following requirements:

    a. Gasket material and thickness approved by manufacturer for intended service, chemical compatibility, pipe system test pressure, and operating temperature range.
    b. Maximum pressure rating of at least 250 psig
    c. Minimum temperature rating: -10°F.
    d. Maximum temperature rating of at least 170°F for water systems operating 140°F and less.

C. Solder Joints (Copper Pipe):

1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined. Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.
2. Flux shall be non-acid type.
3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470°F melting point solder. Remove discs and seals during soldering if they are not suitable for 470°F.

D. Welded Joints (Galvanized Steel Pipe):

1. Welding of all pipe joints, both as to procedures and qualification of welders, shall be in accordance with Section IX, ASME "Boiler & Pressure Vessel Code" unless mandatory local codes take precedence.
2. Furnish to the Owner's Representative prior to start of work certificates qualifying each welder.
3. The Owner's Representative reserves the right to require qualifying demonstration, at the Contractor's expense, of any welders assigned to the job.
4. Ends of pipe and fittings to be joined by butt welding shall be beveled, cleaned to bare metal and internal diameters aligned before tack welding.

5. Single-welded butt joints may be employed with or without the use of backing rings in all sizes. Where backing rings are not used on pumped pressurized systems, the root side of the weld shall either be chipped or ground flush with the piping wall. For services such as vents, overflows, and gravity drains, the backing ring may be eliminated, and the root of the weld need not be chipped or ground. Backing rings shall be of the material being welded.

E. Hub and Spigot Joints - Sanitary Pipe and Storm Pipe (Cast Iron and Stainless Steel Pipe):

1. Lead and Oakum Joints: Pack joint with oakum made of vegetable fiber, cotton, or hemp. Pour joint with molten lead up to top of hub. Ensure leak-free joints by working joint with inside and outside caulking irons.
2. Compression Gasket Joints: Joint shall be one-piece double seal compression type gasket made specifically for joining cast iron soil pipe. Gasket shall be neoprene, permitting joint to flex as much as 5 degrees without loss of seal. Gasket shall be extra heavy weight class, conforming to ASTM C-564.

F. No-Hub Sleeve Gaskets (No-Hub) (Cast Iron Pipe):

1. Gasket shall be heavy weight class, conforming to ASTM C564.
2. The gasket shall have an internal center stop.
3. The gasket shall be covered by a stainless steel band secured with a minimum of four stainless steel bands per fitting/joint.
4. Sleeve gaskets shall be installed in accordance with the manufacturer's installation instructions.

3.11 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfection of the domestic water piping shall be completed within three (3) weeks prior to building occupancy. Contractor is responsible for disinfecting water piping if used by workers during construction; disinfection during construction does not eliminate the requirement for final disinfection prior to occupancy. Flushing of piping shall be completed within two (2) weeks prior to building occupancy.

B. Provide necessary connections at the start of individual sections of mains for adding chlorine.

C. Before starting work, verify system is complete, flushed and clean.

D. Follow the disinfection of potable water procedure outlined in this project’s applicable plumbing code CPC 610.

E. Bleed water from all outlets to ensure chlorine distribution throughout the entire domestic water system.

F. Take water samples, no sooner than 24 hours after flushing, from 2% of outlets and from water entry. Obtain, analyze, and test samples in accordance with AWWA C651, Section 5 - Verification.

3.12 SERVICE CONNECTIONS

A. Provide new sanitary and/or storm sewer services. Before commencing work check invert elevations needed for sewer connections, confirm inverts and verify these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service with water meter with bypass valves. Provide sleeve in wall for service main per Section 22 05 29.

END OF SECTION

SECTION 22 10 30 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cleanouts.

B. Traps.

C. Trap Seals and Primers.

D. Floor Drains and Sinks

E. Hub Drains and Standpipes

F. Roof Drains.

G. Backflow Preventers.

H. Strainers.

I. Unions.

J. Balancing Valves.

K. Water Hammer Arresters.

L. Dielectric Fittings (Connections Between Dissimilar Metals).

M. Air Vents.

N. Drain Valves.

O. Relief Valves.

1.2 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

B. Perform work in accordance with State of California Plumbing Codes and municipality of local area standards.

C. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

D. Valves for potable water systems shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2022 CPC: 604.2 Lead Content.

1.3 REFERENCES

A. ANSI A112.21.1 - Floor Drains.

B. ANSI A112.21.2 - Roof Drains.

C. ASSE 1010 - Water Hammer Arresters.

D. ANSI A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.

E. ANSI A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers.

F. ASME A112.6.9 - Siphonic Drain Test; The American Society of Mechanical Engineers.

G. ANSI 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering.

H. ANSI 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering.

I. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 1.

J. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering.

K. ASSE 1047 - Reduced Pressure Detector Assemblies.

L. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

M. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

N. PDI WH-201 - Water Hammer Arresters.

1.4 SUBMITTALS

A. Include sizes, rough-in requirements, service sizes, and finishes.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Provide cleanouts as shown and specified on the drawings as well as required by code.

B. Coordinate floor cleanout cover with surrounding floor finish. Provide either solid, recessed for tile or terrazzo or carpet marker as applicable.

C. Cleanouts on exposed pipes shall be cast iron with heavy duty cast brass plug with raised head.

D. Cleanout shall be same size as the pipe up to 6" and 6" for larger pipes.

2.2 YARD CLEANOUTS

A. Provide yard cleanouts as shown and specified on the drawings as well as required by code.

B. Cleanout shall be same size as pipe up to 6" and 6" for larger pipes.

2.3 TRAPS

A. Provide all individual connections to the sanitary system with P-traps, except where such drains discharge directly into a properly trapped collection basin or sump. Unless otherwise specified or shown, traps shall be:

1. Chromium plated cast brass when used with plumbing fixtures or when installed exposed in finished spaces.
2. Insulated at accessible lavatories.
3. Cast iron, deep-seal pattern where concealed above ceiling, below grade or in unfinished areas.
4. Deep-seal pattern of the same material and/or coating where drainage lines are of special materials or coatings such as polypropylene, PVDF, CPVC, etc.

B. All traps shall have accessible, removable cleanouts, except where installed on floor drains with removable strainers.

C. Each trap shall be completely filled with water at the end of construction but before building turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with water.

2.4 TRAP SEALS AND PRIMERS

A. Provide trap seals as specified on the drawings.

B. Provide trap primers as shown and specified on the drawings.

C. Where trap primers are shown on drawings, coordinate with corresponding floor drains to ensure they include a side inlet connection for the trap primer line.

2.5 FLOOR DRAINS AND SINKS

A. Floor drains and sinks shall be in the form of a receptor with grate/strainer set flush with the surrounding floor.

B. Provide floor drains and sinks as shown and specified on the drawings as well as required by code.

2.6 HUB DRAINS AND STANDPIPES

A. A hub drain shall be in the form of a hub or pipe without a grate/strainer extending through the floor for receiving indirect waste. A hub drain has a flood level rim above the finished floor.

B. Provide hub drains as shown and specified on the drawings as well as required by code.

2.7 ROOF DRAINS

A. Provide roof drains as shown and specified on the drawings as well as required by code.

2.8 BACKFLOW PREVENTERS

A. Provide backflow preventers as shown and specified on the drawings as well as required by code.

2.9 STRAINERS

A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:

1. Air:

a. 1/4" - 2": 1/32" perforations

2. Water:

a. 1/4" - 2": 3/64" perforations

B. Furnish pipe nipple with shutoff valve to blow down all strainer screens.

C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

2.10 UNIONS

A. Copper pipe - wrought copper fitting - ground joint.

B. Black Steel (Schedule 40) Pipe - malleable iron, ground joint, 150 psi, bronze to bronze seat.

2.11 AUTO-THERMOSTATIC ADJUSTABLE BALANCING VALVE

A. Adjustable thermostatic balancing valve for domestic hot water recirculation circuits. Dry well with temperature gauge and probe. Internal thermostatic balancing cartridge automatically modulates flow to ensure constant temperature. Adjustable from 95°F to 140°F. Set temperature to 10°F below system temperature.

B. Sizes: 1/2" and 3/4" with NPT female connections. Flow rating: 2.1 Cv maximum, 0.23 Cv minimum, 0.52 Cv design. Suitable fluid: Water.

C. Maximum working pressure: 230 psi. Maximum differential pressure: 15 psi. Maximum inlet temperature: 195°F.

D. Low-lead brass valve, stainless steel and copper adjustable thermostatic cartridge, EPDM hydraulic seals, stainless steel springs, adjustment knob with temperature adjustment scale, and tamperproof adjustment locking screw with probe dry-well port with bypass valve for thermal disinfection function with shutoff valve and check valve with temperature gauge. If manufactured unit does not contain integral gauge, Contractor shall install external gauge immediately upstream of unit.

E. Acceptable Manufacturers:

1. B&G Temp Setter

2.12 WATER HAMMER ARRESTERS

A. Provide water hammer arresters as shown and specified on the drawings as well as required by code.

B. ANSI A112.26.1; sized and located in accordance with PDI WH-201, precharged for operation between -100°F and 300°F and maximum 250 psig working pressure.

2.13 DIELECTRIC FITTINGS (CONNECTIONS BETWEEN DISSIMILAR METALS)

A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron, steel, and stainless steel connected to each other.
2. Brass, copper, and bronze connected to each other.

3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):

1. Dielectric waterway rated for 300 psi CWP and 225°F.
2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 47, Grinnell Series 407, Matco-Norca.

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

2.14 AIR VENTS

A. Provide means for venting air at all high points in the piping system and at all other points where air may be trapped.

B. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

2.15 DRAIN VALVES

A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4" male hose thread outlet and cap.

2.16 RELIEF VALVES

A. RV-4: (Domestic Hot Water) Pressure and Temperature relief, cast bronze body and internal parts, stainless steel spring, test lever, threaded inlet and outlet. Maximum setting of 150 psi and 210°°F temperature. Capacities ASME certified and labeled. Acceptable Manufacturers: Cash Series FV, Watts #40, #120, #N240, #340.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Coordinate construction to receive drains at required invert elevations.

B. Install all items per manufacturer's instructions.

C. Water Hammer Arresters:

1. Install water hammer arresters in accessible locations. Provide access doors as required. Coordinate type with Architect/Engineer/Owner.
2. Water hammer arrestors shall be installed in cold and hot water lines upstream of all plumbing fixtures or equipment, with a quick acting valve or multiple quick acting valves. Quick acting valves shall be defined as solenoid actuated valves, manual flush valves, sensor activated faucets and flush valves, squeeze handle spray faucets, and other similar type valves.
3. Install multiple water hammer arrestors in toilet group branch piping greater than 20 feet in developed length from the cold and hot water mains.

D. Cleanouts:

1. Provide cleanouts where shown on the drawings and as required by code, but in no case farther apart than 50 feet in pipe less than 6" size and 100 feet apart in 6" and larger pipes inside the building. Provide cleanouts at bases of all sanitary and storm risers as shown on the drawings and as required by code.
2. Provide a cleanout at the upstream end of a horizontal waste pipe in a plumbing chase serving multiple plumbing fixtures; for example a bank of water closets or lavatories.
3. Provide cleanouts on the branch line connected to individual plumbing fixtures as required by code; for example just below a sink, lavatory or urinal.
4. Extend underfloor cleanouts up to the floor with long sweep elbows.
5. Install a full size, two-way cleanout within 5 feet of the foundation inside[**or outside**] of building.
6. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.
7. Wall cleanouts shall be installed above the flow line of the pipe they serve, but no less than 12" above the finished floor.

E. Yard Cleanouts:

1. Install cleanouts on maximum 90 foot centers (including riser) for pipes 8" and smaller.
2. Extend cleanout to grade. Encase cleanout in 5" thick concrete pad extending 6" beyond cleanout, set low enough not to interfere with lawn mowers.

F. Floor Drains and Floor Sinks:

1. Drains in upper floors shall have a flashing of EPDM or similar membrane sheet. The sheet shall be at least 36" X 36" square with the drain in the center. Clamp membrane in auxiliary clamping ring of floor drain. Membrane is not required if upper floor construction is single pour, cast-in-place concrete.
2. Use alternate sealing method when installing drains in existing floor slabs.
3. Coordinate sloping requirements with the architectural plans and specifications.
4. Top of floor drain and sinks grate/strainer shall not extend above the finished floor elevation.
5. Top of floor drain and sink grate/strainer shall not extend above the finished floor elevation. Grate/strainer shall be installed flush with surrounding finished floor. Should the Plumbing Contractor believe this presents a conflict with code, the issue should be evaluated before installation of the floor drain or sink begins. Proceeding with installing a floor drain or sink raised above the finished floor without prior approval will result in the Contractor being required to remove the drain or sink in question and reinstall it at the approved elevation.

G. Hub Drains and Standpipes:

1. The top of a hub drain/standpipe shall extend above the finished floor elevation. Refer to drawings for dimensions above the finished floor.
2. Access shall be provided to drains and standpipes for rodding.

H. Roof Drains:

1. Roof drains shall have bearing pans.
2. Provide auxiliary support steel under drains as required to prevent movement of the drain.
3. All roof drains shall have underdeck clamps or a manufacturer provided attachment method for the specific roof style the drain is installed in.
4. Drains in built-up roofing systems shall have a 36" x 36" flashing.

I. Backflow Preventer:

1. Provide an air gap fitting and piping to drain. On 2-1/2" and larger units, install a tail piece from air gap fitting to drain to prevent water from spraying out of drain air gap receptor. Maintain air gap distance required by Code.
2. Units shall be field tested and tagged in accordance with manufacturer's instructions and applicable codes by a certified tester before initial operation.
3. Install unit between 12" and 60" above finish floor in a location that is accessible for annual testing and maintenance.

J. Balancing Valves:

1. Install balancing valves with straight, unobstructed pipe section both upstream and downstream as required, per manufacturer's installation instructions.

END OF SECTION

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water Heaters.

1.2 QUALITY ASSURANCE

A. Products and installation of specified products shall conform to recommendations and requirements of the following organizations:

1. American Gas Association (AGA).
2. National Sanitation Foundation (NSF).
3. American Society of Mechanical Engineers (ASME).
4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
5. National Electrical Manufacturers' Association (NEMA).
6. Underwriters' Laboratories (UL).

B. Perform work in accordance with State of California Plumbing Codes and municipality of local area standards.

C. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1 when tested in accordance with DOE 10 CFR, ANSI Z21.10.1 and ANSI Z21.10.3.

D. Conform to ASME Section VIII for construction of water heaters and heat exchangers. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.

1.3 REFERENCES

A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

B. ANSI/ASME Section 8D - Pressure Vessels.

C. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.

D. ANSI/NFPA 70 - National Electrical Code.

E. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

F. ASSE 1005 - Water Heater Drain Valves, 3/4" Iron Pipe Size.

G. UL 174 - Household Electric Storage Tank Water Heaters.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

C. Include heat exchanger dimensions, size of tappings, and performance data.

D. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

E. For equipment connected to an electric power source, submit short circuit rating (SCCR) of integrated unit.

F. Submit manufacturer's installation instructions including control and electrical power/controls wiring diagrams.

G. Submit manufacturer's certificate that pressure vessels meet or exceed specified requirements.

H. Submit operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.6 REGULATORY REQUIREMENTS

A. Water heaters shall conform to AGA, ANSI/NFPA 54, ANSI/NFPA 70, ANSI/UL 1453 as applicable.

B. Conform to ANSI/ASME Section 8 Division 1 for fabrication of steel pressure vessels.

C. Conform to ANSI/ASME Section 10 for manufacture of fiber-reinforced plastic pressure vessels.

PART 2 - PRODUCTS

2.1 WATER HEATERS

A. All water heaters shall be as scheduled on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all items in accordance with manufacturer's instructions.

3.2 WATER HEATER INSTALLATION

A. Install water heaters on concrete bases. Coordinate sizes and locations of concrete bases. Refer to Section 22 05 29.

B. Install water heaters level and plumb, according to drawings, manufacturer's instructions, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend drain piping full size from relief valve and discharge by positive air gap onto closest floor drain. Discharge pipe material shall be same as domestic water piping.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All plumbing fixtures.

1.2 REFERENCES

A. ANSI A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI A112.19.1M - Enameled Cast Iron Plumbing Fixtures.

D. ANSI A112.19.2M - Vitreous China Plumbing Fixtures.

E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

F. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.

G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

H. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.

I. AHRI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

J. ASSE 1002 - Water Closet Flush Tank Ball Cocks.

K. Americans with Disabilities Act (ADA), Title III.

L. The Energy Policy Act (EPAct) of 2005.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 22 05 00. Submittals shall include fixture carriers for record purposes only. Architect/Engineer does not review or approve carriers except for manufacturer.

B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. For fixtures and trim requiring electrical connections, submit product data indicating general assembly, components, electrical power/controls wiring diagrams, and service connections.

PART 2 - PRODUCTS

2.1 FIXTURE REQUIREMENT

A. Plumbing fixtures and accessories provided in a toilet room or bathing room are required to comply with CBC Section 11B-213.2 and shall comply with CBC Section 11B-213.3.

B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender-Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. No pictogram, text, or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENDER RESTROOM", "RESTROOM" or "UNISEX RESTROOM". DSA BU 17-01.

C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.

D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.4.1.

E. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

F. Fixture controls shall comply with CBC Sections 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children's water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.

G. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with the front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.

H. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

2.2 MATERIALS

A. Wall Hung Fixture Carriers:

1. Material: All Metal, ASME/ANSI A112.6.1M.
2. Manufacturers:

   a. Zurn
   b. Smith
   c. Josam
   d. Watts
   e. Mifab.

3. Water closet carrier shall be rated to support 500 lbs. unless noted otherwise on the drawings.

B. All fixtures shall be as scheduled on the drawings.

C. All china shall be from the same manufacturer where possible.

D. All lavatory and sink trim shall be from the same manufacturer where possible.

E. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not contain more lead than allowed per the latest State or Federal Act.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
2. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.
3. Provide fixtures with chrome plated rigid or flexible supplies, loose key stops, reducers, and escutcheons.
4. Install components level and plumb.
5. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound. Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.
6. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water. Refer to DIVISION 7 for "Caulking" requirements.
7. Refer to architectural drawings for fixture mounting heights.
8. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.

B. Wall-Mounted Fixture Requirements:

1. All wall-mounted fixtures shall have compatible carriers designed for their intended service and suitable for the space available and configuration of fixtures. All carriers shall extend to the floor and be anchored to the slab.

C. Floor-Mounted Fixture Requirements:

1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.

D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:

1. All traps exposed under fixtures or inside accessible cabinets shall be chrome plated brass.
2. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
3. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
4. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.

E. ADA Accessible Exposed Sink and Lavatory Trim:

1. All exposed sink and lavatory traps, piping and angle stops installed at accessible sink and lavatory locations shall include offset style drain tailpiece, p-trap installed near and parallel with back wall, and insulation kit specially manufactured for this installation. Armaflex with duct tape is not acceptable.

F. ADA Accessible Water Closet Requirements:

1. Handicapped accessible water closet flush valve handles shall face the center of the stall.
2. Coordinate flush valves in handicap accessible locations with grab bars installed by the General Contractor. Make modifications as necessary to flush valve piping to avoid conflict with grab bars. Common solutions include shortened or offset vacuum breaker tailpieces.

G. Bathtubs and Shower Requirements:

1. All acrylic and fiberglass bathtubs and showers shall have a non-shrink grout or manufacturer-approved material installed between the finished floor and floor of the fixture to prevent damage caused by deflection.
2. All rough-in pockets for showers and tubs located in basement floor installations shall be filled in with concrete and sealed tight.

3.2 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

3.3 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with table on plumbing drawings of minimum sizes for particular fixtures.

END OF SECTION

SECTION 23 05 00 - BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 23 Sections. Also refer to Division 01 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

A. CCR California Code of Regulation

B. CBC California Building Code

C. CFC California Fire Code

D. CEC California Electric Code

E. CMC California Mechanical Code

F. CPC California Plumbing Code

G. California Title 24 - Building Energy Efficiency Standards

H. SCAQMD South Coast Air Quality Management District

1.3 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.

C. Separate contracts will be awarded for the following work:

D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

E. Separate contracts will be awarded for the following work. The division of work listed below is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

F. Scope of Work:

1. Plumbing Work: Refer to Section 22 05 00 "Basic Plumbing Requirements".
2. Heating Work shall include, but is not necessarily limited to:

    a. Furnish and install refrigerant piping, accessories, and final charge of refrigerant.
    b. Furnish and install condensate drain piping from cooling related equipment such as air handlers and cooling coil drain pans.
    c. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    d. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
    e. Complete all applicable tests, certifications, forms, and matrices.

3. Air Conditioning and Ventilating Work shall include, but is not necessarily limited to:

    a. Furnish and install package indoor air handling units complete with dampers, filters, coils, fans, and motors.
    b. Furnish and install package rooftop air handling units complete with curbs.
    c. Furnish and install air-cooled VRF condensing units and curbs.
    d. Furnish and install complete supply air ductwork systems including all fittings, insulation, and outlets.
    e. Furnish and install complete return air ductwork systems including all fittings, insulation, and inlets.
    f. Furnish and install complete exhaust ductwork systems including all fittings, insulation, inlets, and fans.
    g. Furnish and install mechanical room ventilation systems including louvers, ductwork, insulation, and fans.
    h. Furnish and install all temperature control systems.
    i. Furnish and install all fire dampers.
    j. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    k. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
    l. Complete all applicable tests, certifications, forms, and matrices.

4. Temperature Control Work shall include, but is not necessarily limited to:

    a. Furnish and install a complete temperature control system as specified in Section 23 09 00.
    b. Temperature control system shall consist of a full Direct Digital Control (DDC) system including all accessories, sensors, and programming.
    c. Furnish automatic control dampers for installation by others.
    d. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    e. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

5. Fire Protection Work: Refer to Section 21 05 00 "Basic Fire Suppression Requirements".
6. Testing, Adjusting, and Balancing Work shall include, but is not necessarily limited to:

    a. Furnish complete testing, adjusting, and balancing as specified in Section 23 05 93, including, but not limited to, air systems, plumbing systems, and verification of control systems.
    b. Complete all applicable tests, certifications, forms, and matrices

1.4 WORK SEQUENCE

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

B. Itemize all work and list associated hours and pay scale for each item.

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:

    a. Plumbing Contractor.
    b. Heating Contractor.
    c. Air Conditioning and Ventilating Contractor.
    d. Temperature Control Contractor.
    e. Fire Protection Contractor.
    f. Testing, Adjusting, and Balancing Contractor.

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.

a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.

6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Electrical Code Article 725.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:

    a. Light fixtures.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical busduct.
    d. Sheet metal.

e. Electrical cable trays, including access space.
f. Sprinkler piping and other piping.
g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:

a. Condensing Units.
b. Makeup Air Units.
c. Package Air Handling Units.
d. Packaged Rooftop Units.

2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
3. Shall verify all existing equipment sizes and capacities where units are to be modified, moved or replaced. Contractor shall notify Architect/Engineer of any discrepancies prior to ordering new units or replacement parts, including replacements of equipment motors.
4. Temperature Control Subcontractor's Responsibility:

a. Wiring of all devices needed to make the Temperature Control System functional.
b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor.
c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:

1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.

5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

    a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
    b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" (40 mm) and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" (40 mm) and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    d. Maintenance clearances and code-required dedicated space shall be included.
    e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1'-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the Architect/Engineer for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the Architect/Engineer and Owner's Representative. The Architect/Engineer will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The Architect/Engineer reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the Architect/Engineer.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the Architect/Engineer at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the Architect/Engineer and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.7 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the County of San Bernardino Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State and Local Codes.
3. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
5. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
6. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
7. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriters' Laboratories, Inc. and approved by FM Global.

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for service connections, such as gas.
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:

1. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.

a. Any item listed as furnished shall also be installed, unless otherwise noted.
b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.8 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals List:

Referenced Specification Section	Submittal Item
23 05 00	Owner Training Agenda
23 05 03	Fire Seal Systems
23 05 13	Motors
23 05 29	Hangers and Supports
23 05 29	Prefabricated Curbs
23 05 48	Vibration Isolation Equipment
23 05 50	Seismic Restraint Systems
23 05 53	HVAC Identification
23 05 93	Testing, Adjusting, and Balancing

23 07 13	Duct Insulation
23 07 19	HVAC Pipe Insulation
23 09 00	Controls
23 31 00	Ductwork
23 31 00	Ductwork Layout Drawings
23 31 00	Duct Specialties (such as Turning Vanes)
23 33 00	Combination Fire Smoke Dampers
23 34 23	Power Ventilators
23 34 23	Prefabricated Curbs
23 37 00	Grilles, Registers, and Diffusers
23 37 00	Louvers
23 40 00	Filters and Filter Systems
23 73 13	Indoor Modular Air Handling Units
23 73 23	Custom Air Handling Units
23 74 16.12	Packaged Rooftop Air Conditioning Units - 25T and Below
23 81 26	Split System Air Conditioning Units
23 81 45	Variable Refrigerant Flow Heat Pumps

B. General Submittal Procedures: In addition to the provisions of Division 01, the following are required:

1. Transmittal: Each transmittal shall include the following:

   a. Date
   b. Project title and number
   c. Contractor's name and address
   d. Division of work (e.g., plumbing, heating, ventilating, etc.)
   e. Description of items submitted and relevant specification number
   f. Notations of deviations from the contract documents
   g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

   a. Date
   b. Project title and number
   c. Architect/Engineer
   d. Contractor and subcontractors' names and addresses
   e. Supplier and manufacturer's names and addresses
   f. Division of work (e.g., plumbing, heating, ventilating, etc.)
   g. Description of item submitted (using project nomenclature) and relevant specification number
   h. Notations of deviations from the contract documents
   i. Other pertinent data
   j. Provide space for Contractor's review stamps

3. Composition:

    a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
    b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
    c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.
        6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
        7) Dimensions and service clearances are suitable for the intended location.
        8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
        9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

    d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.

e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

   a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
   b. The Contractor shall clearly indicate the size, finish, material, etc.
   c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
   d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions. or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 23 XX XX.description.YYYYMMDD
    b. Transmittal file name: 23 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.9 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 01.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Each piece of equipment requiring shop drawings (e.g., each air handling unit, pump, exhaust fan, etc.). Use the equipment nomenclature (AHU-1, P-1, EF-1, etc.) on the Schedule of Values.
    b. Each type of small unitary equipment (e.g., FCUs, UHs, CABs, etc.). Multiple units of the same type can be listed together, provided quantities are also listed so unit costs can be determined.
    c. Each piping system (chilled water, heating water, steam, condensate, etc.). In addition, for larger projects, break down the material and labor for each piping system based on geography (building, floor, and/or wing).
    d. Each duct system (supply, return, relief, outside air, etc.) listed separately for each unit they serve (AHU-1 supply air ductwork, AHU-1 return air ductwork, etc.).
    e. Pipe insulation with separate material and labor line items for each piping system listed above.
    f. Duct insulation with separate material and labor line items for each duct system listed above.
    g. Temperature controls broken down into material and labor for the following:

        1) Engineering
        2) Controllers, devices, sensors, etc.
        3) Control valves
        4) Control dampers
        5) Conduit
        6) Wiring
        7) Programming
        8) Commissioning

    h. Site utilities (5' beyond building)
    i. Seismic design
    j. Air balancing
    k. Water balancing
    l. Commissioning
    m. Record drawings
    n. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.10 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.11 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Air Cooled Condensers
2. Base Mounted Pumps
3. Boilers, Burners and Boiler Trim
4. Computer Room Units
5. Condensing Units
6. Cooling Towers
7. Gas Fired Makeup Air Units
8. Fire Seal Systems
9. Fluid Coolers
10. Seismic Restraints and Equipment Bracing
11. Water Chillers

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.12 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.13 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.14 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.15 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.16 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the scheduled manufacturer is the basis for job design and establishes the quality required.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. Envelope Around Utilities to 6" Above Utilities: Place sand to a height of 6" over utilities in 6" layers. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
2. Backfill From 6" Above Utilities to Earthen Grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep.
3. Backfill From 6" Above Utilities to Below Slabs or Paved Area: Where the sand fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
4. Backfill Materials:

    a. Sand, CA6: Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
    b. Native Soil: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Native soils shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
    c. Flowable Fill: Cementitious, self-leveling, self-compacting slurry as defined by the ACI with compressive strength of 50-100psi at 28 days; consisting of a mixture of fine aggregate or filler, water and cementitious materials. Filler material consist of sand, fly ash, spent foundry sand, quarry fines, baghouse dust. Cementitious materials consist of Portland cement, pozzolanic materials, and self-cementing materials. Flowable fill may be placed in a pour instead of 6" layers noted above.

5. Water shall not be permitted to rise in unbackfilled trenches.
6. Dispose of excess excavated earth as directed.
7. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
8. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

F. Surface Restoration:

1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

a. Pipe insulation is installed and fully sealed.
b. Pipe and duct wall penetrations are sealed.
c. Pipe identification and valve tags are installed.
d. Main, branch and flexible ducts are installed.
e. Diffusers, registers and grilles are installed and connected to ductwork.
f. Terminal air box reheat coil piping or wiring is complete.
g. Terminal air box control wiring is complete and all control boxes are closed.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 01.

B. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.

4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

C. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Inspection by State Boiler Inspector.
5. Start-up reports on all equipment requiring a factory installation inspection or start-up.
6. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div23.contractor.YYYYMMDD

b. Transmittal file name: O&Mtransmittal.div23.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Refer to Section 23 09 00 for additional requirements for Temperature Control submittals.
5. Copy of final approved test and balance reports.
6. Copies of all factory inspections and/or equipment startup reports.
7. Copies of warranties.
8. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
9. Dimensional drawings of equipment.
10. Capacities and utility consumption of equipment.
11. Detailed parts lists with lists of suppliers.
12. Operating procedures for each system.
13. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
14. Repair procedures for major components.
15. List of lubricants in all equipment and recommended frequency of lubrication.
16. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

E. The instructions shall include:

1. Explanation of all system flow diagrams.
2. Explanation of all air handling systems.
3. Temperature control system operation including calibration, adjustment and proper operating conditions of all sensors.
4. Maintenance of equipment.
5. Smoke control systems.
6. Stairwell pressurization systems.
7. Start-up procedures for all major equipment.
8. Explanation of seasonal system changes.
9. Description of emergency system operation.

F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.

G. Minimum hours of instruction for each item shall be:

1. Air Handling System(s) - 4 hours.
2. VRF Heat Pump System - 4 hours.
3. Exhaust System(s) -1 hour.
4. Temperature Controls - As defined in Section 23 09 00.

H. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

I. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The mechanical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. Operate all HVAC systems continuously for at least one week prior to occupancy to bring construction materials to suitable moisture levels. Areas with mechanical cooling shall be maintained below 60% RH.

D. Contractor shall adjust the mechanical systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

E. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

F. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraphs supplement Division 01 requirements.

B. Maintain at the job site a separate and complete set of mechanical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings to indicate revisions to piping and ductwork, size and location, both exterior and interior; including locations of coils, dampers, other control devices, filters, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (e.g., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

D. Refer to Section 23 09 00 for additional requirements for Temperature Control documents.

E. Before completion of the project, a set of reproducible mechanical drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

F. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

G. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

H. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

1. All piping in mechanical room

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:

1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all drain pans and areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed bare metal ductwork, piping, hangers, and accessories.

D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:

1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.

2. South Coast Air Quality Management District Rule 1168: Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
3. South Coast Air Quality Management District Rule SCAQMD 1113: Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
    d. Protect stored on-site and installed absorptive materials from moisture damage.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".
10. If permanently installed air handlers are used to serve both construction and occupied areas, all return grilles throughout construction areas shall be sealed to prevent air from construction areas being supplied to occupied areas.
11. If permanently installed air handlers are used during construction to serve only construction areas and do not supply air to adjacent occupied areas, MERV 8 filtration media shall be used to protect each return air grille or opening. The intent of this will be to prevent construction dust and debris from entering any return or supply air ductwork in the facility. All filtration media shall be replaced immediately prior to occupancy.

12. Construction areas shall be maintained at a negative pressure at all times during construction. When areas are under construction, HEPA filtered exhaust fan(s) shall be installed in sufficient quantities as required to maintain construction areas at sufficient negative pressure as called for in the Owner's Infection Control Risk Assessment (ICRA). HEPA filtered exhaust fan discharge shall be ducted either outdoors or back into designated hospital areas as called for in the Owner's ICRA.
13. For each area under construction, the Contractor shall install a negative pressure indicator equivalent to Lamiflow Model L-102F as manufactured by Lamiflow Technologies. Contractor shall regularly monitor and record the negative pressure condition of the construction areas as called for in the Owner's ICRA.

3.13 MAINTAINING CLEAN DUCTWORK THROUGHOUT CONSTRUCTION

A. Throughout the duration of construction, all ductwork shall be capped or sealed with sheet metal caps, polyethylene film, or other airtight protective to keep dust, dirt, and construction debris out of ducts. Similar means shall be used to seal air-side connections of HVAC equipment to include, but not limited to, air handling units, fans, terminal air boxes, fan coil units, cabinet heaters, blower coils, and the like.

B. When air terminal devices are installed, contractors shall seal all supply, return, and exhaust grilles with polyethylene film or other airtight protective to keep dust, dirt, and construction debris out of ducts.

C. Should HVAC equipment be started during construction, Contractor shall remove airtight protectives and shall install one-inch thick MERV 8 filter media over all return and exhaust grilles to prevent dust, dirt, and construction debris from entering ductwork. Filter media shall cover the entire grille face and shall be secured such that air cannot bypass filter media.

D. Should filter media become laden with dust and dirt, Contractor shall replace filter media with new media to prevent damage to air distribution system and equipment.

E. The following steps shall be taken during testing, adjusting, and balancing of each air system:

1. All construction activities in all spaces served by the air system shall stop.
2. All airtight protectives and temporary filter media shall be removed from all portions of the air system.
3. Testing, adjusting, and balancing work shall not commence until all construction activity is stopped and all airtight protectives and temporary filter media is removed.
4. Once testing, adjusting, and balancing work is complete for the air system, airtight protectives or temporary filter media shall be installed over all ductwork openings and air terminals on the air system prior to resuming construction activities in any spaces served by the air system.

F. The Owner shall agree the building is sufficiently clean prior to the removal of any filtration media and airtight protectives from air terminal devices.

3.14 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

B. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.